A Brief History of GFCATCH (1954-1995), the Groundfish Catch and Effort Database at the Pacific Biological Station

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ABSTRACT

Rutherford, K. L. 1999. A brief history of GFCATCH (1954-1995), the groundfish catch and effort database at the Pacific Biological Station. Can. Tech. Rep. Fish. Aquat. Sci. 2299: 66 p.

Catch and the Department of Fisheries and Oceans have collected effort statistics for the British Columbia groundfish fishery since 1945. Data sources have included interviews with vessel skippers, daily vessel logbooks, landing records (sales slips or validation records) and observations at the waterfront. This document provides a brief history of the data collection procedures, as well as an updated description of the GFCATCH database, its user interfaces and the changes over time.

RÉSUMÉ

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Depuis 1945, le secteur de la capture et le ministère des Pêches et des Océans recueillent des statistiques sur l'effort dans la pêche du poisson de fond en Colombie-Britannique. Les sources des données sont des entretiens avec les capitaines, les journaux de bord des bateaux, les registres des débarquements (bordereaux de vente ou dossiers de validation) et les observations au port. Le présent document donne un bref historique des méthodes de collecte des données, ainsi qu'une description à jour de la base de données GFCATCH, de ses interfaces utilisateurs et de son évolution avec le temps.

INTRODUCTION

The Department of Fisheries and Oceans have collected catch and effort statistics for the British Columbia groundfish fishery since 1945. Data sources have included interviews with vessel skippers, daily vessel logbooks, landing records (sales slips or validation records) and observations at the waterfront. The information was summarized annually in a number of departmental publications (see Thomson and Yates 1961a,b,c,1962a,b,c,d; Thomson and Lippa 1963,1964; Thomson *et al.* 1965; Thomson and Holmberg 1966; Prest 1968,1969; Smith 1970,1971,1972,1973,1974, 1975,1976,1977,1978,1979,1980,1981; Leaman 1982,1983,1984,1985,1986; Leaman and Stanley 1987; Rutherford 1988,1990,1991,1992,1993,1994,1996). The GFCATCH system (Leaman and Hamer 1985) at the Pacific Biological Station contains most domestic trawl catch data from 1954 -1995, some longline data from 1979-1986 and most trap data from 1979-1995. The data within this system can be broken up into a number of different eras, with each "era" having enhancements over the previous generation. This document provides a brief history of the data collection procedures, as well as a description of the actual GFCATCH database, its user interfaces and the changes over time. It must be noted that the GFCATCH database is now a static archive of historical catch data and that data from 1996 forward is stored elsewhere.

DATA SOURCES

Historically, groundfish catch data in GFCATCH came from three sources: logbooks, landing records (sales slips or validation records) and anecdotal information. Logbook information was filled out by the skipper or, in more recent years, by an on-board observer. Information on where, when and what was caught was recorded and transcribed by DFO staff into a trip report. The logbooks provided good information on areas and amount of effort but only estimates of catch amounts. Species composition information was usually limited to dominant retained species. Sales slips or, in more recent years, validation records recorded what was actually unloaded at the dock. They provided an accurate estimate of weight but very little information on fishing area or amount of effort. The accuracy of species composition was variable. Anecdotal information such as viewing an offload or interviewing the vessel's crew often provided information that was used to supplement and even override the data provided by the other two sources.

To obtain the "best" estimate of catch and effort for a trip it required the combination of these two or three data sources. The actual weights from the landing records were substituted onto the trip reports and prorated to replace the estimates provided by the logbooks. Logbook data were transcribed into trip reports and the data were entered into a succession of databases until the development of the GFCATCH system in 1982. A complete description of the database and the data entry process is available in Leaman and Hamer (1985). Changes were made in how the data were loaded into GFCATCH over time and these changes are described in this document. Appendix A provides a complete listing of the field definitions used in GFCATCH.

Appendix B provides a complete listing of the codes used. Data streams in GFCATCH were separated by gear type and source code (Appendix A - a). The source code provides an indication of whether logbook data were entered or just sales slip information (no effort information).

TRAWL LOGBOOKS 1954-1987

During this period, most trawl fishers used logbooks provided by the Pacific Biological Station. The actual format of the logbooks changed over the years but the basic premise was that fishers would record the where, when and what of their fishing trips. These logbooks were considered confidential and were given to the port liaison officers on a voluntary basis. Fishers in early years tended to group tows in their logbook, such that one entry (record) might reflect one or more tows, with depth, time towing, and locality "rolled-up" for a group of tows. The fisher would summarize all the tows made at the same fishing location into one entry or "rollup of tows". For example, a single entry on a trip report might be: Fishing ground = Cabbage Patch, 6 tows, total towing time = 12 hours, depth 20-30 fm and a catch of 24,000 lb. of Pacific cod. Few discard comments and poor species resolution characterized Fisher logs.

In the early years the fishers probably only reported some species as a group name such as "rockfish", "sole" or "ocean perch". In fact, these groups probably contained several similar species that were sold for the same price. It should be stressed that fishers provided the data in this rolled-up fashion (for location information and for species groupings) and that they were not forced to report the information this way. In the 1970's the logbooks were changed so that all the information for each tow was recorded on a single line of the logbook (one record per tow) (Appendix C, Figure 4). However, during data processing by DFO staff the tows continued to be rolled up to maintain comparability.

Using the logbooks, the port liaison officer would prepare a "trip report". The trip report reflected the same structure as a fisher log, except for two changes. Firstly, the port liaison officer further rolled-up the tows so that each trip tended to have even fewer records (more lumping). In the case of each tow being recorded separately the port liaison officer did all the lumping, based on the same criteria. Preparation of the trip report also involved coding fishing ground into a Major Area, Minor Area, and Locality coding format, e.g. Cabbage Patch = 03-23-05 (Appendix D). Appendix C, Figures 1, 2 and 3 illustrate what trip reports looked like during this era and Appendix C, Figure 4 illustrates an original logbook from the later part of this era.

Secondly, if the port liaison officer observed an unloading, they enhanced the species composition information. They reported on the species composition of these groups and their observed species breakdown was applied to the group. For example, the fisher may have recorded 30,000 lb. of perch in his logbook. The port liaison officer observed that there was actually 50% Pacific ocean perch and 50%

yellowmouth rockfish and recorded 15,000 lb. Pacific ocean perch and 15,000 lb. yellowmouth rockfish on the trip report.

Important: No record was kept of which trip's data were enhanced through observation.

The trip report data were entered into a number of different databases through the years but these are not documented here. In 1982, the GFCATCH database was implemented (Leaman and Hamer 1985) and historic data from 1954 forward were added. Trawl trips entered as trip reports from logbooks were given a source code of 1. Data stored in the GFCATCH database are in two formats; one format for the 1954 -1981 period and another for the 1982 -1995 period (Leaman and Hamer 1985). Although the data structures for these two periods are slightly different, it is important to note that the meanings of the data fields remained the same. During data retrieval (e.g. with GFSEL) these differences are transparent to the users. In 1986, the name of the skipper for each trip was added to the database. GFCATCH field definitions and codes are listed in Appendices A and B, respectively.

Completion of logbooks remained voluntary until mid-1987. However, as the number of trawl landings increased, the port liaison officers were only able to observe a small percentage of the vessels being unloaded. This meant that enhanced species composition information was not available for the majority of landings and the proportion of observed unloadings declined over the years.

TRAWL LOGBOOKS 1987-1993

In mid-1987 submission of most logbook information became mandatory. The logbook consisted of three pages (Appendix C, Figures 4, 5) 1. A **white** original, which included all the mandatory information - date and times of set, management area and subarea, amount of each species caught; sent to groundfish management. 2. A **yellow** carbon, that included all the same information as the white original but had additional space for detailed geographic coordinates, fishing ground names and depths; sent to Science staff at the Pacific Biological Station (PBS) for permanent archiving. 3. A **pink** carbon that included the same information as the yellow carbon; retained by the fisher. The intent was to maintain the confidentiality of detailed tow locations.

Logbooks continued to be processed into trip reports, mainly by the port liaison officers, in the same manner as mentioned for the 1954-1986 era, until mid-1989. At this time a relational database computer entry program was developed in RBASE to facilitate logbook processing. This program, HOMESYS, was used on a trial basis in 1989 for some logbooks. The remainder of the logbooks were processed using the old method. HOMESYS was used to create a hard copy of the trip report in the same format as Appendix C, Figure 3 and an ASCII text file that could be loaded directly into the GFCATCH database. In 1990, the HOMESYS program and its field equivalent, FIELDSYS, were fully implemented. Area codes were calculated from charts using geographic coordinates or ground names. In early 1992, area polygons

were digitized and a program, SA.FOR, was developed to convert either latitude/longitude or Loran C bearings to groundfish area codes. Appendix E illustrates fishing grounds, groundfish major and minor areas and the digitized area polygons.

The GFCATCH system was altered again in 1991 to store logbook data in a tow-by-tow format. Changes were made to the HOMESYS and FIELDSYS programs to accommodate this. Trip reports were still printed out in hard copy in the "rolled-up" format (summarized by area, gear, and depth) but data were archived in a tow-by-tow basis (see 6.1.1). In 1994, latitude/longitude fields were added to GFCATCH.

TRAWL LOGBOOKS 1994-1995

In 1994 it became mandatory for fishers to submit all logbook information, including detailed geographic coordinates. The logbook continued to consist of three pages and data processing of logbooks continued using the HOMESYS program. An example of the logbook format is shown in Appendix C, Figure 5.

In 1994 and 1995 there were a small number of at-sea observer trips. The resulting observer logs were identical in structure to fisher logs but typically included more species. An attempt was made to incorporate these observer trips into the GFCATCH system but problems were encountered. The basic problem was that GFCATCH would allow a maximum of 35 species-utilization combinations per trip. In many of the observer trips there were greater than 35 combinations and this meant that in order to load trips into GFCATCH some discards had to be grouped to reduce the number of combinations. For example, all rockfish discards were grouped as species code 388, miscellaneous species such as skate, ratfish, dogfish were grouped as 015. This process of grouping discards was very time-consuming and the loading of observer trips was stopped.

In the GFCATCH database flags were added to indicate whether logbook data were from an observer or a fisher (Appendix A – r) and whether actual landed information was from a sales slip or the dockside monitoring program (Appendix A -s). In late 1995, it became obvious that the now 18-year old FORTRAN database structure had to be completely redesigned to keep up with changes in the source data. The decision was made to develop a relational database structure. Data entry was terminated in GFCATCH on December 31, 1995.

TRAWL SALES SLIPS

Sales slip information was used to improve the estimated amounts provided by the trawl logbooks (see Section 3). Trips entered into GFCATCH as only trawl sales slips were given a source code of 2 (Appendices A – a, B – a)

Sales slips were documents produced by the fish buying companies and it was mandatory that a copy of each slip be turned into DFO. Sales slips recorded species name, product type, catch weight and price as well as vessel name, landing date, a list of management areas fished and a crude estimate of number of days fished. The area information was not really useful as there was no reference as to where particular amounts or species of fish were caught. An example of a sales slip is shown in Appendix C, Figure 11.

Species compositions recorded on the sales slips were intended to reflect the true catch but similar species were often lumped together, especially if the prices were the same. Often the species information seemed to be at the whim of the processors.

As trip limits became more restrictive in the 1980's, an increasing proportion of these data may have been intentionally falsified to avoid prosecution. However, it is assumed that no matter how much fish was misreported as other species, there was little evidence that actual volumes were missed. Thus, total groundfish landings were probably accurate, just misclassified.

TRAWL VALIDATION RECORDS 1994-1995 (THE "NEW" SALES SLIP)

In 1994 a mandatory dockside-monitoring program (DMP) was implemented under contract for most trawl landings. Those landings excluded from the program were landings from the Strait of Georgia (minor areas 12-19, 28, 29) as well as some from the west coast of Vancouver Island (major area 3C) domestic hake fishery. This was changed in 1995 to include all landings. Information from the DMP was recorded on a document called the validation record. When available, the validation record was used instead of the traditional sales slip. The validation record was simply a more detailed and more accurate sales slip. Dockside monitoring introduced more detailed sorting, thus the new version of the old sales slip was identical in structure but simply had more species entries.

TRAP LOGBOOKS 1979-1995

Sablefish trap fishery logbook and sales slip data have been entered into the GFCATCH system as for the trawl data starting in 1979. Trips entered as trip reports from logbooks were given a source code of 5. Logbook information was summarized (rolled-up) into a trip report based on combining sets from similar areas. Examples of trap fishery logbooks are shown in Appendix C, Figures 6-9 and an

example of a trap fishery trip report is shown in Appendix C, Figure 10. Data were summarized manually and entered into GFCATCH using the ADD option until about 1991. As with trawl, the name of the vessel skipper for each trip was added beginning in 1986. In 1991 an RBASE program called SABLESYS was developed to aid the entry of these trips. The data were first keypunched and then read into SABLESYS. A trip report was produced and the data were imported into GFCATCH. Sablefish trap trip reports were much less complicated than trawl because there was usually only one species caught during the trip.

In 1990 sablefish logbook data were entered into GFCATCH in a string-by-string format. In 1994 latitude/longitude information was added.

TRAP SALES SLIPS 1979-1995

Trap sales slips were very similar to those of trawl trips. Trips entered into GFCATCH as only trap sales slips were given a source code of 6.

TRAP VALIDATION RECORDS 1990-1995

A dockside monitoring for sablefish landings was introduced in 1990. These data were used in place of sales slips, when available.

LONGLINE LOGBOOKS 1979-1986

Longline logbook and sales slip data were entered into the GFCATCH system as for trawl and trap data starting in 1979. Trips entered as trip reports from logbooks were given a source code of 3. Longline vessels in the sablefish fishery used the same logbooks as the trap fishery, shown in Appendix C, Figures 6-9. Longline fisheries for other species, such as dogfish, most often used the log shown in Appendix C, Figure 7. Logbook information was summarized into a trip report based on combining sets from similar areas. The trip report format was the same format as for the trap fishery, Appendix C, Figure 10. Data were summarized manually and entered into GFCATCH using the ADD option. Longline trip reports were much less complicated than trawl because there were fewer species caught during the trip.

The entry of longline data into GFCATCH was discontinued after 1986 due to staffing reductions.

LONGLINE SALES SLIPS

Longline sales slips were very similar to those of trawl trips. Trips entered into GFCATCH as only longline sales slips were given a source code of 4. With the discontinuation of the entry of longline data into GFCATCH after 1986 the sales slip databases supported by the Statistics Unit in Vancouver remained the only real source of catch data for this gear type.

SYNTHESIS OF LOGBOOKS AND LANDING RECORDS

SYNTHESIS OF TRAWL LOGBOOKS AND LANDING RECORDS

In order to obtain the best estimate of catch, the information from the two types of documents was merged. The highly detailed catch and effort information from the logbooks was combined with the actual weights of each species landed supplied by the landing records.

During the era when trip reports were done manually the sales slip information was received from the fish company and the actual landed weights were written in a reserved column on the trip report (Appendix C, Figures 2,3). The estimated catch in each area from the fisher log was then updated by prorating the total catch to what the fisher had reported as coming from that tow or tows (ratio of estimated total to actual). Changes were made to the existing data in the database using the MODIFY option of the GFCATCH program.

In cases where species were reported on the sales slip (usually small amounts) but were not reported in the fisher log these amounts were added to the trip report and subjectively assigned to an appropriate area(s) based on knowledge of species interactions, depth, area and fishing effort. Any dressed weights were converted to round weights before entry into the data system.

Note: small amounts observed at unloading but not reported by the fisher were subjectively assigned to one or more tow records.

If a trip report was not available from a logbook, the data were entered from the sales slip information only. These data lacked detailed information on fishing areas, depths and amount of effort. In GFCATCH, the "source" field indicates which data streams have been used for derivation of catches for that landing. If logbooks or a combination of logbooks and sales slips were used for a trawl trip then source=1 and if only sales slips were used then source =2.

Note: Finished catch version for a trawl trip could take one of three forms:
1. Based on sales slip only (questionable area, no effort), Source = 2
2. Based on logbook only (questionable total amounts, poorer species composition) Source = 1 Utilization code = 7 – to reflect that sales slip was never used
3. Based on both logbooks and sales slips, Source = 1, Utilization code = 1 or 2 0r 3 or 5

Note: never query the database for CPUE information using source = 2. You can add in catches for sales slip only trips, but they do not include effort.

Sales slip information was added to the trip reports using the MODIFY option of GFCATCH until the end of 1989. At this time a FORTRAN program, SALES.FOR, was written to mechanize the process of prorating the actual amounts to the estimated amounts. With the advent of tow-by-tow storage, modifications were made to SALES.FOR. Difficulties arose in assigning the species that were not recorded on the fisher log but were recorded on the sales slip. Fish had to be assigned to all tows in the most appropriate area or assigned to individual tows in one or more areas. This was a time-consuming process.

With the introduction of the dockside monitoring program the validation record was used in place of sales slip whenever possible. Since the validation record produced many more detailed catches by species than the sales slip this greatly complicated the task of assigning catches that were on the validation record, but not on the logbook, to areas or sets.

SYNTHESIS OF TRAP LOGBOOKS AND SALES SLIPS

Trap logbooks and landing records were merged in the same way as for trawl. The limited number of species landed by these trips made the process far simpler.

Note: Finished catch version for a trap trip could take one of three forms:
1. Based on sales slip only (questionable area, no effort), Source = 6
2. Based on logbook only (questionable total amounts, poorer species composition)
3. Source = 5, Utilization code = 7 - to reflect that sales slip was never used
4. Based on both logbooks and sales slips, Source = 5, Utilization code=1 or 2 or 3 or 5

Note: never query the database for CPUE information using source=6. You can add in catches for sales slip only trips, but they do not include effort.

SYNTHESIS OF LONGLINE LOGBOOKS AND SALES SLIPS

Longline logbooks and landing records were merged in the same way as for trawl. The limited number of species landed by these trips made the process far simpler.

Note: Finished catch version for a longline trip could take one of three forms:

1. Based on sales slip only (questionable area, no effort), Source = 4
2. Based on logbook only (questionable total amounts, poorer species composition Source = 3, Utilization code = 7 - to reflect that sales slip was never used
3. Based on both logbooks and sales slips, Source = 3, Utilization code=1 or 2 or 3 or 5

Note: never query the database for CPUE information using source=4. You add in catches for sales slip only trips, but they do not include effort.

RELATIONSHIP WITH SALES SLIP DATABASE

The sales slips for all fish landings, including groundfish, have also been separately stored in other databases. The Statistics Unit in Vancouver has maintained the sales slip information for the period 1951 to the present in various formats. Since 1982 the data have been maintained in an ADABAS database. This system is severely limited by the number of new species codes that can be added. Although the sales slip data contained sometimes limited information on species composition the ADABAS system was still unable to accommodate them all. For example, the ADABAS system had only 4 species codes available for rockfish even though there are more than 20 different species landed. For trawl and trap landings the GFCATCH system was used to help enhance the sales slip system's area breakdowns but nothing could be done about the limited number of groundfish species that could be entered. In 1994 an INGRES database, SLIP, was created to better store groundfish sales slip information. It was able to accommodate any number of species codes. However, since this system was based on the same sales slips it still only provided a subset of the information that GFCATCH provided (except price). For this reason GFCATCH remained the most useful database for obtaining detailed groundfish trawl catch and effort information. However, SLIP remains as the only source of catch data for some other groundfish fisheries, particularly the longline fishery and in some years for the hook and line fishery.

Note: SLIP is the only source for price data although the price data is inaccurate. Sales slip values do not include "under-the-table" values as well as end of the year "kick-backs" or bonuses.

RELATIONSHIP TO PACFIN

The Pacific Fishery Information Network (PACFIN) is a catch database created and maintained by the Pacific States Marine Fisheries Commission in Seattle, Washington. It was primarily created in the early 1980's to contain catch data submitted by the four western states, Alaska, Washington, Oregon and California. In order to give a complete picture of catches off the western coast of North America DFO was asked to contribute catch information from British Columbia. Summary catch data from GFCATCH was electronically forwarded to PACFIN for the years 1981 to 1995. This data contained catch weights by species, by gear, by month, by major area. In addition, a hard copy of effort information from the annual catch and effort reports (e.g. Table 2, Leaman 1982) was forwarded. Until 1990 a hard copy was also submitted for catches by gear types other than trawl and trap, i.e. longline, handline etc. Beginning in 1991 the catch data for these other gear types was obtained electronically and included with the annual data feed.

RECAP OF SHORTCOMINGS OF GFCATCH DATA

For some fisheries the data contained in GFCATCH are limited, incomplete or missing altogether. As mentioned previously, the entry of longline data was suspended due to staffing reductions. GFCATCH does not include any catch data for the offshore joint-venture and national/supplemental hake fisheries. It is also missing catches from research trips.

RETAINED SPECIES COMPOSITION

Since its inception the collection of catch data relied on the at-sea estimates of fishers. Until mid-1987 the submission of logbooks was voluntary. In the early years, until the mid-1980's, the sometimes limited species information entered by the fishers was enhanced by verbal communications and direct observations by the port liaison officers. The port liaison officers were able to cover a fairly large proportion of landings, compared to recent years, as there were a smaller number of trips landed to a more limited number of ports. The proportion of landings that were observed by the port liaison officers decreased through the late 1980's and early 1990's. In 1994 the inception of the dockside-monitoring program helped to address this problem. All eligible landings were observed during the unloading process.

Note: because it depended on voluntary recording of species compositions GFCATCH grossly underestimated the numbers of species caught. Catches of less important species tended to be lumped with dominant species by the fishers.

DISCARD INFORMATION

Discard information, as provided on fisher's logbooks, has always been limited because fishers have not consistently recorded what they discarded. Although discard information was recorded in GFCATCH, whenever recorded by fishers, the amounts do not reflect what was truly discarded. Amounts of discards have been grossly underestimated (possibly less than 10% recorded) and the information should be used with caution.

Note: discard amounts from fisher logs do not reflect what was truly discarded (grossly underestimated) and the information should be used with caution.

USER INTERFACES

GFSEL

On-line queries of GFCATCH can be conducted using a program called GroundFish SELection (GFSEL) (Leaman and Hamer 1985). Users enter a number of criteria to select catch records for a particular species, area or gear. The values are then summarized in an output report.

Use of the GFSEL program is described in Leaman and Hamer (1985). However, since the writing of that document, numerous fields have been added to the database. In 1986 a field was added for skipper and in 1994 fields were added for initial unloading port, start and end latitude/longitudes, tow number, logbook source (e.g. fisher, observer) and "sales" source (e.g. sales slip, validation record). All of the fields in GFCATCH are listed in Appendix A. The HELP function within GFSEL can be used to list all of the available fields and there is also HELP within each option that explains it further. The BOAT_ID and SKIPPER fields both have restricted entry as the information is classed as confidential. A password is required before information on boat or skipper can be obtained. GFSEL is not able to select on latitude/longitude but will put latitude/longitude data in the FLATFILE output.

Rollup option

The rollup option was created within GFSEL to allow users to convert the tow-by-tow data, entered from 1991-1995 for trawl and 1990-1995 for trap, into a simulated rolled-up format (groupings by location, gear and depths). This was very important for producing the calculations of catch per unit effort (CPUE) for a time-series that spanned the two periods (pre- and post-1991). The main difference between the rolled-up data and the tow-by-tow data was the way that tows with zero catch were treated. Using the tow-by-tow data and selecting for a particular species would exclude the tows with zero catch. Using the rolled-up data the tows with zero catch would be

included with tows in the same area and depth range and thus would be used for CPUE calculations.

GFREAD

In addition to GFSEL, a FORTRAN subroutine called GFREAD was written for users to gain access to the groundfish master data files (Leaman and Hamer 1985). GFREAD can be interfaced with user programs by linking it to the user program. The proper linking procedure is:

$LINK yourprog, NAN1:[DEMERSAL.PROGRAMS]DEMLIB'CHIP'/LIB, NAN1:[DEMERSAL.SKIPPER]SKIPLIB'CHIP'/LIB

Additional notes on changes in GFREAD and the GFMSTCOM.FOR master files are contained in Appendices F and G, respectively. It should be noted that the rollup version of GFREAD, GFREADR, does not have access to the new variables added in 1994 (lat/longs, unloading port, tow number).

GFCATCH AS A RELATIONAL DATABASE ON AN SQL SERVER

Data from the GFCATCH database were downloaded using the SAVE option in GFSEL. This option was revised by Marc Hamer to output all header information followed by species catches (one species per line). Therefore, each header represents an "event" that can signify a tow or set for 1991 on, or a trap haul from 1990 on. Prior to these years, tows were "rolled-up", indicated by the number-of-sets field containing values greater than 1.

Details on how the data were transferred from the FORTRAN database to an ACCESS database are given in the latter's documentation (A-tables). The data are stored in B-tables (B1_Trips: 66,327 records, B2_Events: 272,382 records, B3_Catch: 1,036,224 records) and support information is housed in C-tables. All tables were upsized to an SQL server (PACSTAD) in a database called GFCATCH. Users can access GFCATCH through an ACCESS 97 front-end database called GFCatchShell.mdb found at \\PACSTAD\STADAPPS\dbShells. The shell contains ODBC links to the documentation, data, and support information tables. The individual user copies this shell to his personal drive and can tailor the copy to suit his needs.

FUTURE DIRECTIONS

With the suspension of GFCATCH we initiated the development of a new catch database (PACHARV V1.0). It was to have the following features:

1. Comprehensive (all data streams maintained);
2. Objective (no guessing at where catch came from);

3. Current (within 24 hours);
4. Efficient (low maintenance);
5. Accurate (quality control at data input);
6. Compatible (connected to other regional databases);
7. Compliant with regional and national standards.

It was also to serve as a template for other fisheries. At the time of writing, the database is still in development.

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APPENDICES

APPENDIX A - FIELD DEFINITIONS FOR GFCATCH (SEE APPENDIX B FOR LISTING OF CODES)

a) Source

The source code indicates where the data for each trip in the GFCATCH system originated. There are two sources for groundfish catch data:
1) trip reports derived from a combination of logbooks and landing records, complete with effort information and
2) information from a landing record, either a sales slip or validation record, which does not include any effort information.
There is nothing in the GFCATCH database that indicates that both data sources were used.

b) Serial number

A serial number was assigned to each unique trip (landing) entered into the GFCATCH system during a calendar year. The numbers are unique only within a given fishing year, i.e. each year the numbering starts at 1.

c) Date of landing

This is the date that a vessel returns to port at the end of a fishing trip. It is the only date associated with the trip in GFCATCH as the dates of individual sets or fishing events are not stored. When catch and effort statistics are compiled all of the fish associated with a given trip are assigned to only the landing date, although the trip may have been a week or more long.

d) Port

For most years in the GFCATCH database only a single port location was coded. This was usually the port where the fish was bought and processed. This means that if the fish were unloaded at one port (e.g. Steveston) and trucked to another port (e.g. U.S.A) the port code would have been entered as U.S.A. In the early years this was probably not an issue as most processing was done where the fish was landed. Starting in the 1980's the amount of fish being trucked, particularly to the U.S.A, increased but there is not any documentation available on amounts. Starting in 1994 the GFCATCH database began storing both the unloading port and the destination port.

e) Vessel

Each unique vessel that fished for and landed groundfish was assigned a serial number. This serial number was independent of all other identifiers such as CFV number or tabs. The serial number belonged to the vessel and remained the same even if the vessel name or CFV number changed. Associated with each vessel are a number of descriptive characteristics. The information on vessels is stored in the master file GFVESSELS.MST and is maintained by the program

VESSEL. GFVESSELS.MST contains the vessel name, vessel code, gross tonnage, class code (based on gross tonnage) and horsepower for each year. The functions of the VESSEL program are to add, modify and list the information in the master file. Vessel information is considered to be classified and requires the entry of a password when extracting data with GFSEL or GFREAD.

f) Class

The vessel class is the code assigned to a vessel, based on its gross tonnage. The class code is useful for categorizing catch and effort statistics by vessel size.

g) Gear

This field defines valid gear types within trawl trip reports and sales slips only. Trap types are defined in Appendix B - w. There is not a separate field in GFCATCH to define longline type.

h) Aids to navigation

This field defines various combinations of navigational and fishing aids that were on board vessels. This code was probably valid during the early years of the database but in later years the advances in technology were immense and these changes/additions were not documented in this database. Most vessels, from the mid 1980's on, were given a code of 7 meaning they had the most advanced navigational aids available

i) Length of trip

This is the length of time in days from when a vessel left port to go fishing (departure date) until its return (landing date).

j) Area

The area codes used in the GFCATCH system are listed in Appendix C and they are illustrated in Appendix D. They are a three-part system:

United States led to standardization between the two countries in the reporting of groundfish catches on the Pacific coast. Catches were assigned to major

statistical areas, also known as Pacific Marine Fisheries Commission (PMFC) areas and later as Pacific States Marine Fisheries Commission (PSMFC) areas (Appendix D, Figure 6). These areas were modified in 1960 and 1961 with the development of new grounds for trawling. Most changes affected areas far offshore where trawling was conducted almost exclusively by trawlers from Washington. This meant that early B.C. catch and effort statistics (i.e. 1954-1961 in GFCATCH and published summaries) did not have to be revised (Thomson & Holmberg, 1966).

2. Minor area -- Minor areas are unique codes used to give more detailed information on area of capture for groundfish. Minor areas are contained within a major (PSMFC) area and are based on former Fisheries Management

statistical areas (in effect from at least the early 1950's until 1984) with some modifications (Appendix D, Figure 6).

3. Locality - Locality codes are contained within minor areas and were intended to try to assign catch to fishing grounds. In the early days of the trawl fishery the grounds were quite discrete and confined to trawlable areas (Appendix D, figures 1-5). However, with improvements and modifications to trawl gear very few areas remained untrawlable and the sense of distinct fishing grounds was reduced.

4. Geographic coordinates -- For many years fishers voluntarily recorded either a fishing ground name or geographic coordinates (latitude/longitude or Loran C) on their fishing logs. From this information an area code (major, minor, and locality) was assigned. In early 1992, in an attempt to standardize the conversion of geographic coordinates to areas, area polygons were digitized and a program was developed to convert the coordinates to our codes (Appendix D, Figures 7-11). This removed much of the subjectivity involved in assigning area codes by different people. Fields for start, end and mid-point latitude/longitude were added to the database in 1994.

k) Days fished

This number has been of limited value in the GFCATCH system but was given to the Catch Statistics unit for use in their database as a measure of effort.

l) Number of sets or drags

As described in the overview of GFCATCH the fishing events (sets) that occurred in the same area during a trip were "rolled up" into a single entry in the database. This field recorded how many sets were rolled up. With the introduction of tow-by-tow, in 1991 for trawl and in 1990 for trap, the number of sets was always 1.

m) Time

This field recorded the duration of a fishing event in hours. Decimals are accepted, e.g. 2.5 or 24.67. For trawl, it is not known with any certainty whether times were consistently recorded at winch lockup and release or at some other point during the deployment of the gear. Trawl towing time is used in calculations of catch-per-unit-effort (CPUE). For longline or trap the average length of soak time for a group of sets in the same area was recorded. With the introduction of tow-by-tow the soak time for each set was recorded.

n) Depths

Minimum and maximum depths were recorded, in fathoms, and the average depth was calculated by GFCATCH. The depth recorded in the logs was always assumed to be the bottom depth for bottom trawl. These depths do not reflect the true range of bottom depths that were encountered during a tow. For midwater trawl the depth recorded was supposed to be the net fishing depth but it is not really known if this was the depth recorded on the fishing logs.

o) Species

Allowable species codes for fish in GFCATCH are based on Hart (1973) with the code corresponding to the page number on which the species description was found. A full explanation of the "Hart" coding system for fish can be found in Gillespie (1993). Codes for invertebrates, within the GFCATCH system, range from 900-999. These numbers overlap codes in the Hart system and were assigned during the design of GFCATCH to keep the species code as a numeric field (Appendix C - k)

p) Utilization codes

These codes were used to categorize what was done with the fish after it was caught. A tow (or tows) may therefore be associated with 3 catches of the same species, one catch is retained and one catch is discarded, and one catch is dumped by the processor.

q) Species catch

This field contains the amount of a species caught, recorded in pounds.

r) Logbook information source

This field was added in 1994 to indicate the source of fishing log information. This was required to distinguish between information from fishers, on-board contract observers and DFO personnel.

s) Landing or sales type indicator

For the trawl fishery, the final catch figures for a fishing trip were taken entirely from sales slips prior to 1994. In 1994 a dockside-monitoring program was implemented for the majority of landings and the validation report produced by the monitor was used instead of the sales slip as it was believed that the information was more reliable.

t) Number of skates set

Prior to 1990 this corresponded to the number of "lines" set for trap or longline in a particular area. From 1990 on, each set was a single entry in GFCATCH and the number of skates set was always 1.

u) Number of hooks or traps

This is the total number of hooks or traps that caught the fish for a grouping of sets (pre-1990) or set (for 1990 and on). The number of traps (trap fishery) and 1000's of hooks (longline fishery) were used in the calculation of catch-per-unit-effort (CPUE).

v) Spacing

This is the length, in feet, between hooks or traps.

w) Trap type

This code indicates the type of trap used: Korean (conical), rectangular or a mixture.

x) Bait

This indicates the type of bait used for longline or trap gear types.

y) Skipper

A field for skipper was added in 1986. Skipper information is considered confidential and the entry of a password is required when extracting data using GFSEL or GFREAD.

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APPENDIX B - CODE TABLES FOR GFCATCH

a) Source

1	Trawl trip report
2	Trawl sales slip or landing record only
3	Longline trip report
4	Longline sales slip
5	Trap trip report
6	Trap sales slip or landing record only

b) Port

1	Vancouver
2	Fraser River - Steveston, Richmond, Albion, Delta, Ladner, Surrey
3	Prince Rupert, Port Edward, Port Simpson
4	Victoria, Sidney
5	Namu
6	Klemtu, Butedale
7	Port Hardy, Bull Harbour, Sointula, Port McNeill
8	West coast Vancouver Is - Tofino, Ucluelet, Bamfield, Winter Harbour
9	Other - Nanaimo, Cowichan Bay, Campbell River, Powell River, Salt Spring Island

c) Class

1	0-14 gross tons
2	15-24 gross tons
3	25-49 gross tons
4	50-74 gross tons
5	75-99 gross tons
6	100-149 gross tons
7	150-199 gross tons
8	200-299 gross tons
9	300-399 gross tons
0	400+ gross tons

d) Gear (only used with trawlers)

0	Unknown
1	Single
2	Double
3	Double and drum (most commonly used code for bottom trawl)
4	Shrimp trawl
5	Single and drum
6	Gillnet drum
7	Danish seine
8	Midwater trawl
9	Pair trawl

e) Navigational aids

0	None
1	Radar
2	Loran
3	Fish finder
4	Radar and loran
5	Radar and fish finder
6	Loran and fish finder
7	Radar, loran, fish finder or sonar or echo sounder

f) Utilization codes

1	Food fish - kept; used for human consumption
2	Animal/mink feed - ground up into meal for animals; not fit for human consumption
3	Reduction - ground up for uses such as fertilizer; not fit for human consumption
4	Dumped - at the dock, not processed in any way; usually rotten
5	Bait - caught for the sole purpose of being used for bait in another fishery
6	Discarded - at sea, either an unmarketable species, undersize or over a prescribed quota
7	Landed but not reported as sold - trip report was created from a fishing log but a landing record, a sales slip or validation record, was never received

g) Trap type

1	Korean traps/pots
2	Collapsible or rectangular traps
3	Mix of Korean or collapsible traps

h) Bait (for longline and trap gear)

1	Herring
2	Pacific cod
3	Mixed herring and Pacific cod
4	Mixed herring and pollock
5	Squid
6	Mixed herring and sablefish
7	Mixed bait (unspecified)
8	Herring and squid
9	Hake

I) Fishing log source

1	Vessel skipper's information
2	Contract observer information
3	DFO observer information

The default setting is 1 and all trips prior to 1994 have this code.

j) Landing or sales source

M Monitored landing (used validation record instead of sales slip)
U Unmonitored landing (used sales slip)
X Landings prior to 1994, dockside monitoring program was not in place
The default setting is X for trips prior to 1994 and M for trips for 1994 and later.

k) Invertebrate species codes

900	Sponges	940	Annelids
901	Urn	941	
902	Glass	942	Polychaete (sandworms)
903	Bath	943	
910	Coelenterates (seapens)	944	Leech
911	Hydroid (Velella)	945	Sipunculid
912	Jellyfish	949	Isopod
913	Anemone	950	Crustaceans (Arthropoda)
914	Coral	951	Branchiopod
920	Echinoderms	952	Ostracod
921	Sea lilies	953	Copepod
922	Starfish	954	Barnacle
923	Brittle stars	955	Euphausid
924	Urchin	956	Shrimp, pink
925	Sand dollar	957	Shrimp & prawns
926	Sea cucumber	958	Shrimp, sidestripe
930	Molluscs	959	Shrimp, other
931	Chiton	960	Crabs
932	Tooth shell	961	Box crab
933	Univalves (Abalone)	962	Dungeness crab
934	Bivalves (clams, scallops, mussels)	963	Hermit crab
		964	King crab
935	Octopus (devilfish)	965	Queen crab
936	Squid	966	Spider crab
937	Squat	967	Tanner crab
938	Loligo squid	968	Munida
939	Giant Squid	996	No. of pink shrimp/lb.
		997	No. of prawn,shrimp/lb.
		998	No. of sidestripe shrimp/lb.
		999	Unknown invertebrates

APPENDIX C - EXAMPLES OF RAW DATA FORMS

Figure 1 - Example of a trip report used during the 1940's and 1950's.

Figure 2 - Example of a trip report used from the 1960's until 1975.

Figure 3 - Example of a trip report used from 1976 until the early 1990's.

Figure 4 - Example of log used for the trawl fishery during the 1970's and 1980's.

Figure 5 - Example of log used for the trawl fishery during the 1990's.

Figure 6 - Example of log used for the sablefish trap and longline fisheries in the late 1970's and early 1980's.

Figure 7 - Example of log used for the sablefish trap and longline fisheries and other longline fisheries in the early 1980's.

Figure 8 - Example of log used for the sablefish trap and longline fisheries in the late 1980's and early 1990's.

Figure 9 - Example of log used for the sablefish trap and longline fisheries in the mid to late 1990's.

Figure 10 - Example of a trip report for the sablefish trap and longline fisheries and other longline fisheries.

Figure 11 - Example of a sales slip.

TRIP REPORT

VANCOUVER, B.C. 130

Date

NHB

Boat

otter trawler

Skipper

3 men

Where fishing
(as much detail as possible)

NW corner of the Goose Island grounds
52 fathoms.

Number of entries for this trip

1

Length of trip

2 weeks

Weather tough Breakdowns?

Amount of effective fishing time 3 days or Hours 22½
18 drgs of 1¼ hrs

Landing. Pounds of fish or liver by species.

Brill	11,000	
ling cod	2,000	35
bastard Halibut	1,000	

total flatfish 12,000 other 2,000
liver 35

Kinds of fish caught and discarded

Any tags

Remarks:—Sizes, conditions, abundances, etc., of fish of various species. Water temperatures for tuna boats. Other boats observed.

Lot of feed, big patches showing on th·
machine. Brill full of shrimp
some sockeye seen jumping off Hakai
Pass.

Appendix C - Fig. 1.. Example of a trip report form used during the 1940's and 1950's.

TRIP REPORT

Date..... Dock or Company..... Port of Landing.....

Boat..... Kind of Gear.....

Skipper..... Length of Trip.....

Where fishing

Days fished	Sets Skates Drags	Hours	AREAS FISHED	Fthms.
1				
2				
3				
4				
5				
TOTAL				

Landing. Pounds of fish or liver by species.

Species	1	2	3	4	5	TOTAL Estimated	TOTAL Weighed

LIMITS
—Specify

Kinds of fish caught and discarded

.....

.....

.....

Weather

Breakdowns?

Any tags

.....

.....

Remarks:—
(See Back)

Appendix C - Fig. 2. Example of a trip report form used from the 1960's until 1975.

TRIP REPORT

Date ..... Dock/Company ..... Port of Landing .....
Boat ..... Skipper ..... Gear .....
Length of Trip
Minor Areas Fished

DATE(S) FISHED	DAYS FSHD	SETS DRAGS	HOURS	Areas Fished	CODE	DEPTH (FMS)
1						
2						
3						
4						
5						
6						
7						
8						
9						

Landings. Pounds of fish by species.

Species	1	2	3	4	5	6	7	8	9	Est.	Actual

Comments

Appendix C - Fig. 3 . Example of a trip report form used from 1976 until the early 1990's.

VESSEL NAME _____ TRIP LIMITS _____

TRIP NO. _____ DATE LEFT _____ DATE RETURNED _____

DAILY FISHING LOG

Date	Drag No.	Search *Hours	Area Fished			Depth Range (fm)	Duration	English Sole	Rock Sole	Dover Sole	Other Flatfish (specify)	Ocean Perch	Other Rockfish (specify; greenies, canaries etc.)		Pacific Cod	Ling Cod	Other Fish (specify)	Discards (Specify)
			Locality	Set	Haul													
Total																		

REMARKS

Weather, navigation, etc.

Net Type	Net 1		Net 2	

* Time spent prospecting on grounds before setting gear. (Do not include time spent running from one ground to another.)

Appendix C - Fig. 4 . Example of log used for the trawl fishery during the 1970's and 1980's.

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GROUNDFISH TRAWL FISHING LOG

VESSEL _____ CAPTAIN _____ NAIL REPORT NUMBER _____ TRIP NUMBER _____ PAGE NUMBER OF TRIP _____

DEPARTURE DATE _____ LANDING DATE _____ PORT OF LANDING _____ PROCESSOR/ COMPANY _____ LOCATION OF PROCESSOR/ COMPANY _____

NAME OF FISHING GROUND	LORAN CO-ORDINATES OF TOW: SET	LORAN CO-ORDINATES OF TOW: HAUL	DEPTH RANGE (FTMS)	SPECIFY SET # OF SET	DATE	TOW NO.	NMFT SUB AREA	TIME	PLATFOOT (lbs/kg)	PACIFIC OCEAN PERCH	YELLOW-MOUTH ROCKFISH	ROUGH-EYE ROCKFISH	CANARY ROCKFISH	BLACK-GRAY ROCKFISH	YELLOW-TAIL ROCKFISH	OTHER ROCKFISH (species)			PACIFIC COD	LINGCOD	SABLE-FISH	OTHER FISH (species)			DISCARDS (species)	
								SET																		
								HAUL																		
								SET																		
								HAUL																		
								SET																		
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LOGS REMOVED BY _____								TOTALS																		

COMMENTS: Weather, sea conditions, tide, water temperature, hard, suggestions, tags, etc. _____

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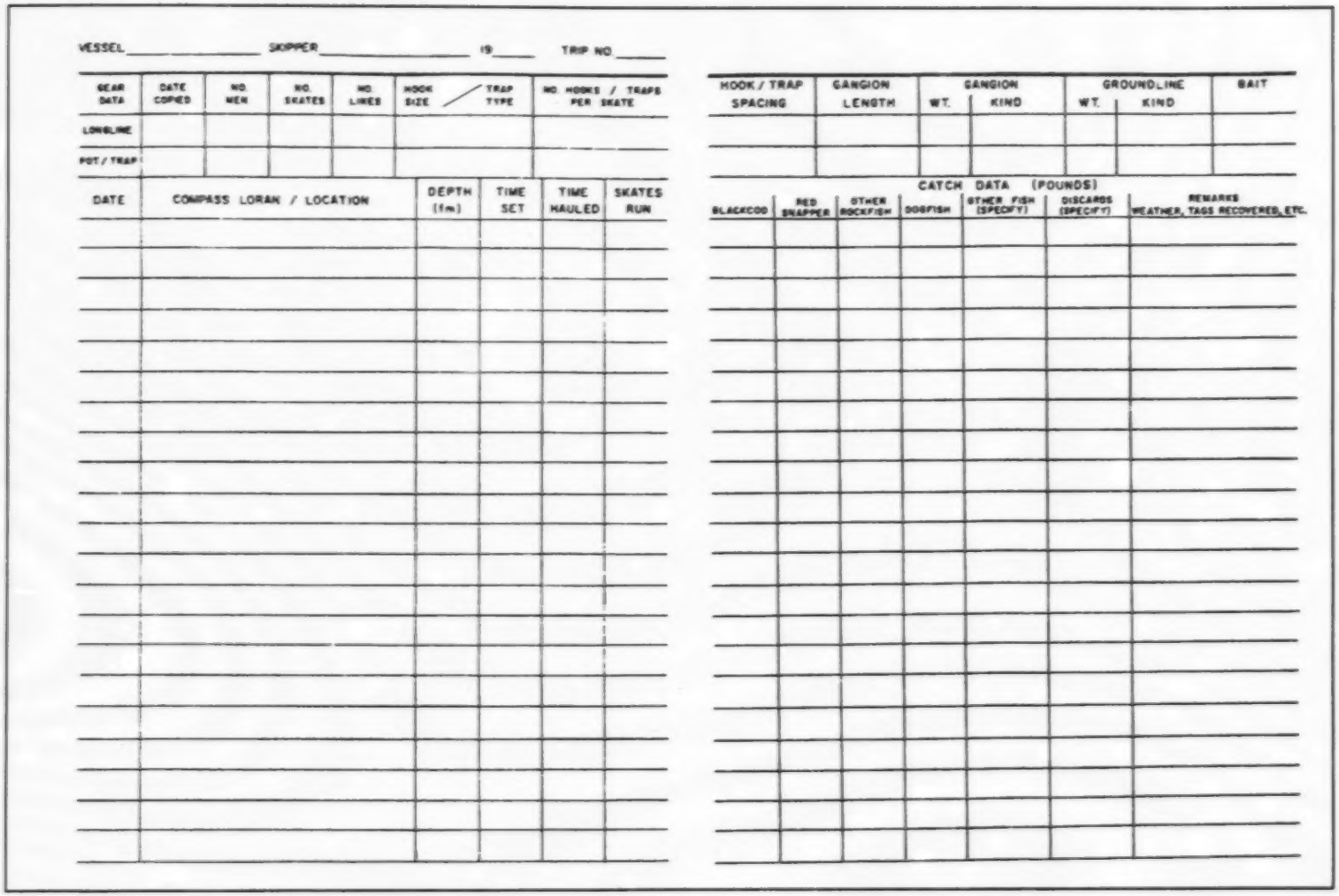
Appendix C - Fig. 5 . Example of a log used for the trawl fishery during the 1990's.



VESSEL _____ SKIPPER _____ 19____ TRIP NO _____

GEAR DATA	DATE COPIED	NO. MEN	NO. SKATES	NO. LINES	HOOK SIZE / TRAP TYPE	NO. HOOKS / TRAPS PER SKATE
LONGLINE						
POT / TRAP						

HOOK / TRAP SPACING	GANGION LENGTH	GANGION WT.	GANGION KIND	GROUNDLINE WT.	GROUNDLINE KIND	BAIT

DATE	COMPASS LORAN / LOCATION	DEPTH (fm)	TIME SET	TIME HAULED	SKATES RUN

CATCH DATA (POUNDS)

BLACKCOD	RED SNAPPER	OTHER ROCKFISH	DOGFISH	OTHER FISH (SPECIFY)	DISCARDS (SPECIFY)	REMARKS WEATHER, TAGS RECOVERED, ETC.

Appendix C - Fig. 6 . Example of log used for sablefish trap and longline fishery in the late 1970's and early 1980's.

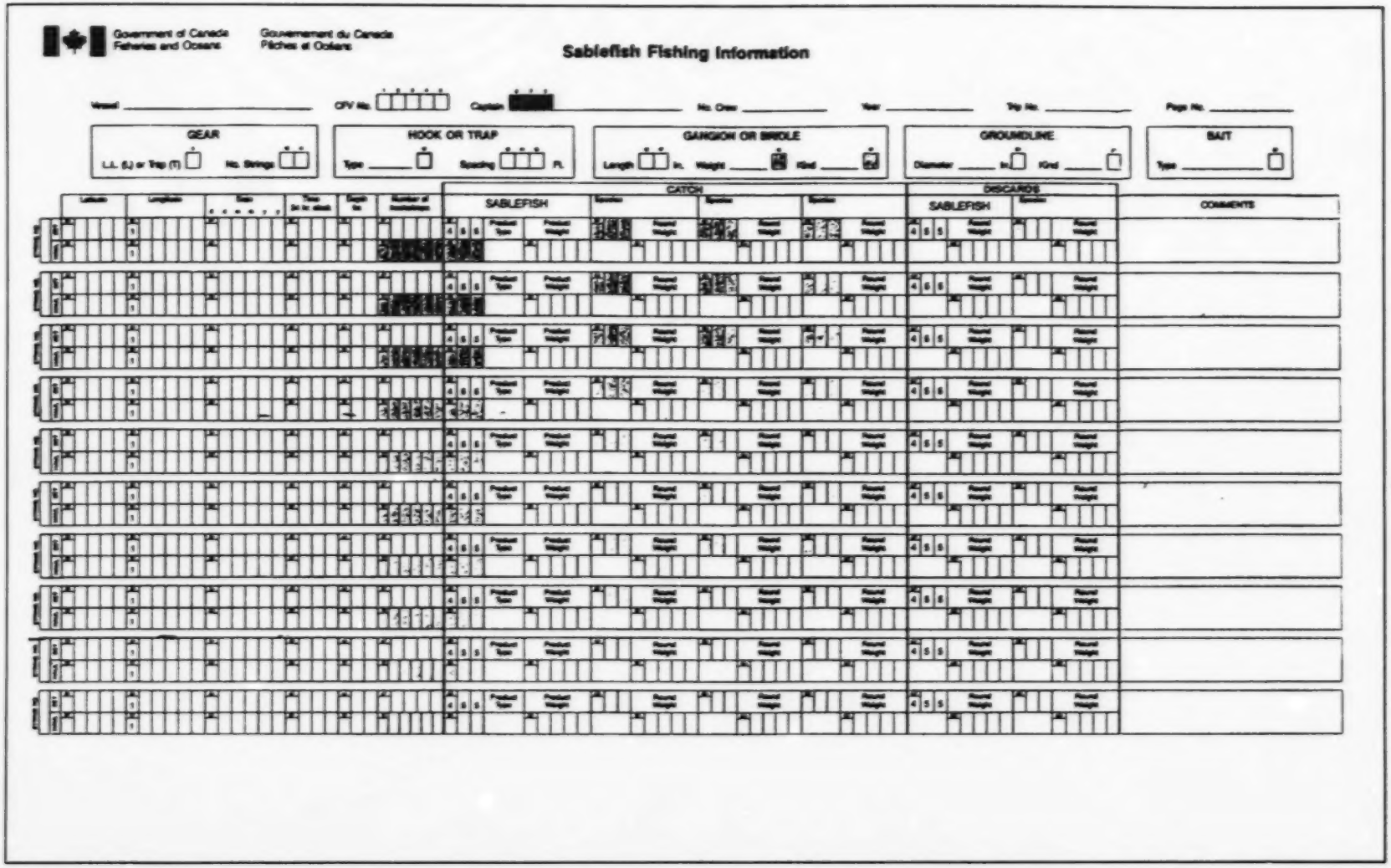
VESSEL _____ SKIPPER _____ LANDING DATE _____

PORT OF LANDING _____

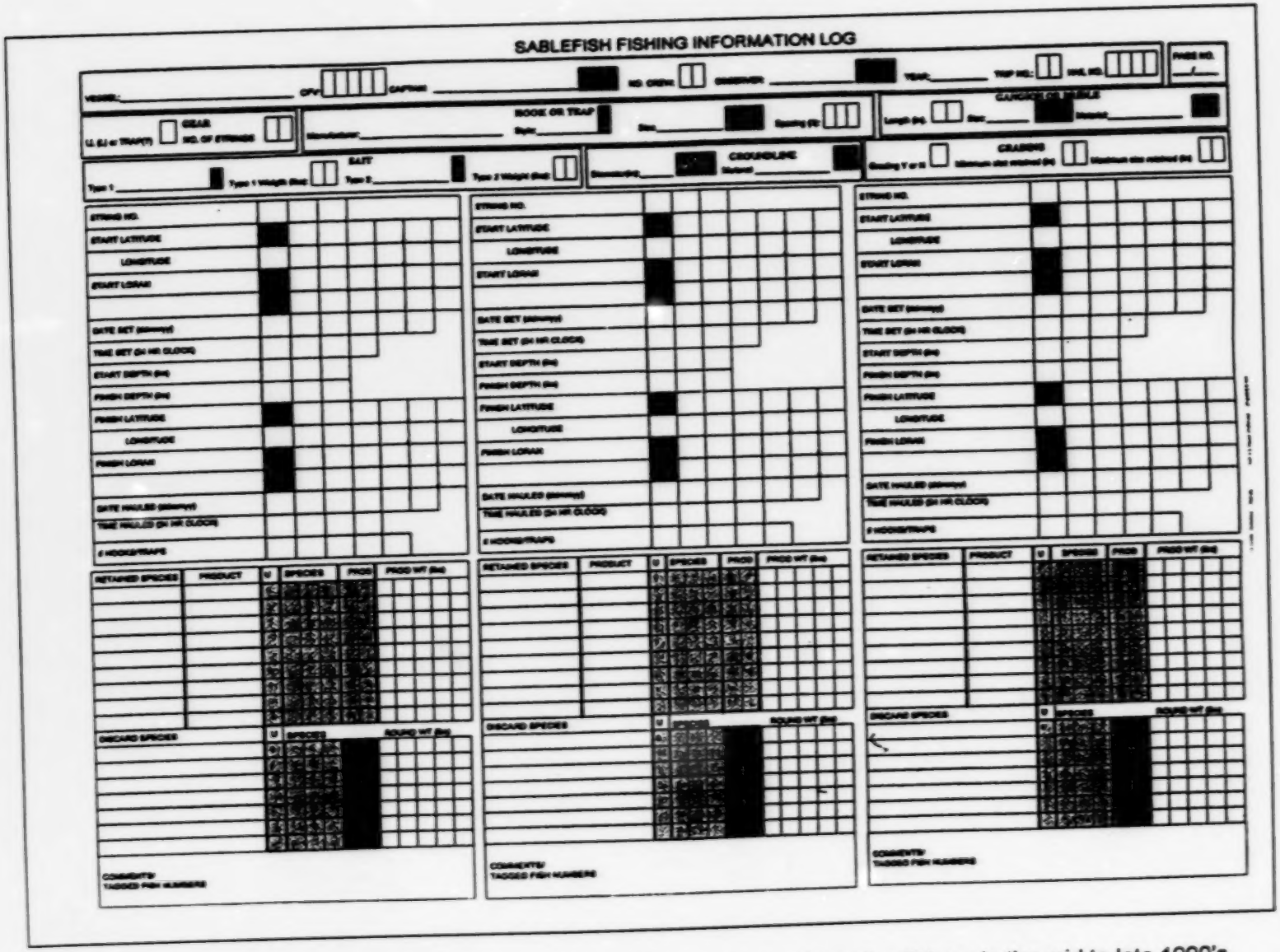
GEAR DATA:	NO OF SKATES	NO OF LINES	HOOK SIZE / TRAP TYPE	NO. HOOKS/TRAPS PER SKATE	HOOK/TRAP SPACING	GANGION LENGTH	GANGION WT/KIND		GROUNDLINE WT / KIND		BAIT USED
LONGLINE											
TRAP											

DATE	LOCATION AND LORAN READING	DEPTH (fm)	HOURS SET	SKATES RUN	CATCH DATA (POUNDS) DOG-FISH	RED SNAPPER	OTHER ROCK FISH	BLACK COD	OTHER (SPECIFY	DISCARDS SPECIFY)	REMARKS (SEA CONDITIONS, WEATHER, TAGS, ETC.)

Appendix C - Fig. 7 Example of a log used for sablefish trap and longline fisheries and other longline fisheries in the early 1980's.



Appendix C - Fig. 8. Example of log used for the sablefish trap and longline fishery in the late 1980's and early 1990's.



Appendix C - Figure 9 . Example of logbook used for the sablefish trap and longline fishery in the mid to late 1990's.

TRIP REPORT

DATE _____ DOCK/COMPANY _____ PORT OF LANDING _____

BOAT _____ SKIPPER _____ GEAR _____

LENGTH OF TRIP _____ MINOR AREAS FISHED _____

DATE FISHED	NO. OF SKATES	SOAK HOURS	FISHING LOCATION	AREA CODE	DEPTH (fms.)
1					
2					
3					
4					
5					
6					

LANDED CATCH OF FISH BY SPECIES (lbs.)

SPECIES	1	2	3	4	5	6	EST.	ACTUAL
TOTAL								

DISCARDS	1	2	3	4	5	6	EST. WT. (lbs.)
TOTAL							

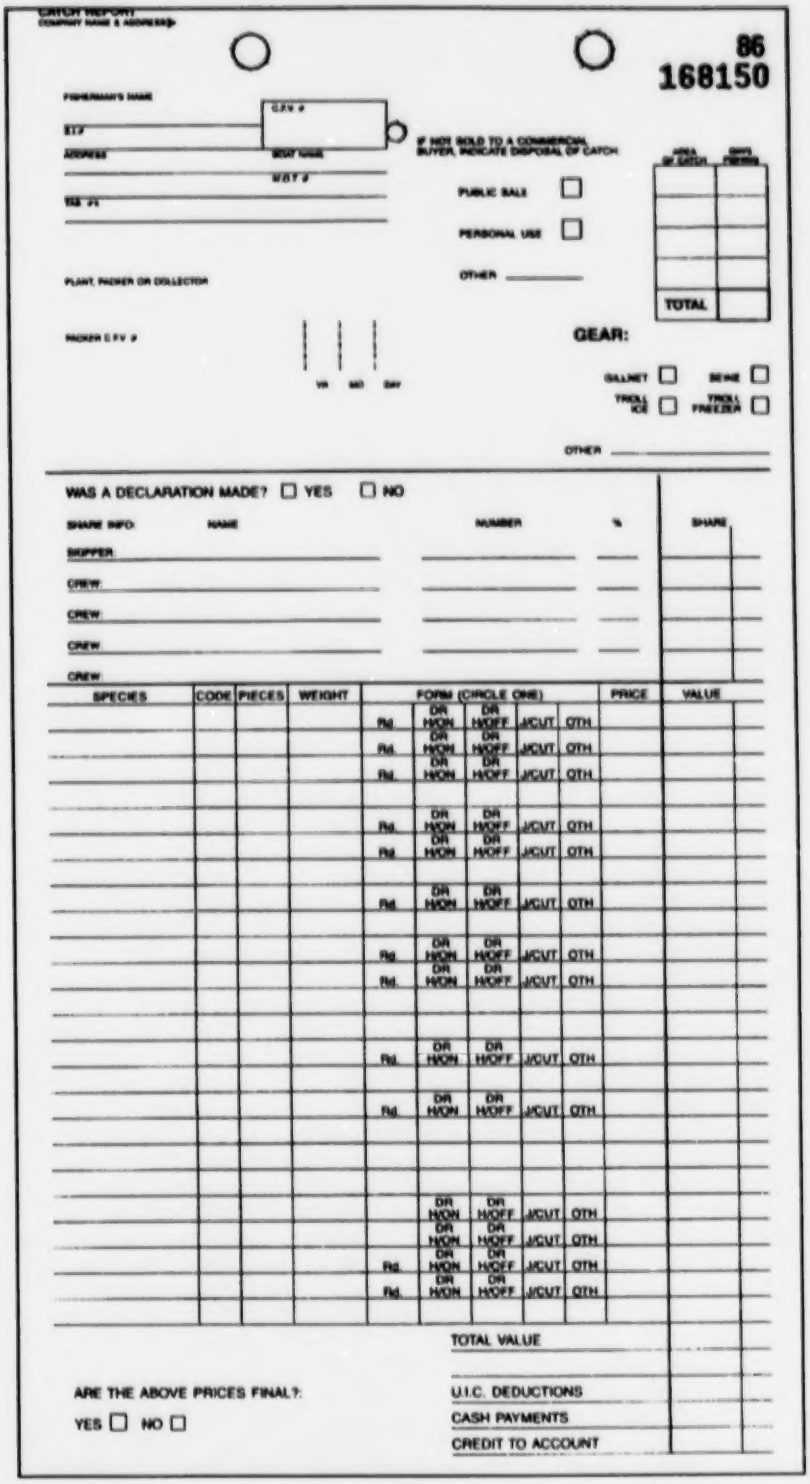
GEAR DATA

GEAR TYPE	NO. MEN	NO. SKATES	NO. LINES	HOOK SIZE / TRAP TYPE	NO. HOOKS / TRAPS PER SKATE — COMMENTS

HOOK / TRAP SPACING	GANGION LENGTH	GANGION WT.	GANGION KIND	GROUNDLINE WT.	GROUNDLINE KIND	BAIT TYPE

COMMENTS

Appendix C - Fig.10 . Example of a trip report for the sablefish trap and longline fisheries and other longline fisheries.



CATCH REPORT
COMPANY NAME & ADDRESS

86
168150

FISHERMAN'S NAME
C.F.V. #
ET #
ADDRESS
BOAT NAME
M.O.T. #
SS. #

IF NOT SOLD TO A COMMERCIAL BUYER, INDICATE DISPOSAL OF CATCH:

PUBLIC SALE ☐
PERSONAL USE ☐
OTHER _____

AREA OF CATCH | DAYS FISHING

TOTAL

PLANT, PACKER OR COLLECTOR

PACKER C.F.V. #

YR MO DAY

GEAR:

GILLNET ☐ SEINE ☐
TROLL ICE ☐ TROLL FREEZER ☐

OTHER _____

WAS A DECLARATION MADE? ☐ YES ☐ NO

SHARE INFO:	NAME	NUMBER	%	SHARE
SKIPPER				
CREW				
CREW				
CREW				
CREW				

SPECIES	CODE	PIECES	WEIGHT	FORM (CIRCLE ONE)					PRICE	VALUE
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
					DR H/ON	DR H/OFF	J/CUT	OTH		
					DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		
				Rd.	DR H/ON	DR H/OFF	J/CUT	OTH		

TOTAL VALUE

U.I.C. DEDUCTIONS

CASH PAYMENTS

CREDIT TO ACCOUNT

ARE THE ABOVE PRICES FINAL?

YES ☐ NO ☐

Appendix C - Fig.11. Example of a sales slip.

APPENDIX D - GROUNDFISH AREA CODES

Modifications to groundfish area codes, March 1992

Below is an updated list of groundfish area codes and some notes on changes and additions that have been made. Most changes were made to reflect the fact that several grounds are divided by boundaries between minor areas. Most of the areas added were to fill in gaps in our former codes. This is especially noticeable in minor area 23 where new hake fishing grounds have been showing up. Some grounds were also added to better reflect sablefish trap fishing grounds as these did not always fit into the traditional trawl grounds.

The main reason for revamping the area codes at this time was the development of a program to convert latitude/longitude or Loran C coordinates to our statistical area codes. This involved drawing out the grounds on the charts and digitizing the major areas, minor areas and localities.

Notes on changes to groundfish fishing area codes - March 17, 1992

Major Area 4B:

Minor area 17 - added locality 13 (17 Central) to more completely cover hake fishing grounds. Would formerly have been coded as Winchelsea (11), Unknown (00) or Other (09).

Minor area 29 - added locality 07 (South Gabriola) to more completely cover hake fishing grounds. Would formerly have been coded as 29 Middle West (06), Unknown (00) or Other (09).

Major Area 3C:

Minor area 21 - do not use locality 05 (Nitinat Canyon). This locality is actually all in minor area 23.

Minor area 23 - add locality 13 (Nitinat Canyon) which was incorrectly coded as minor area 21 prior to this time.

- add locality codes 14 (12 Mile), 15 (West Gully), 16 (Barkley Hake) to more completely cover hake fishing grounds. Would formerly have been coded as Big Bank (05), Unknown (00) or Other (09).

- add locality 17 (Nitinat Hake) to more completely cover hake fishing grounds. Would formerly have been coded as Fingers (06), Unknown (00) or Other (09).

Minor area 24 - add locality 08 (South Estevan). Estevan ground is divided by boundary between minor areas 24 & 25 and it has been split into south and north to reflect this. It was formerly all in area 25.

Minor area 25 - change locality code 01 to North Estevan. See notes in area 24 on South Estevan.

- change locality code 03 to Esperanza East (formerly just Esperanza). Esperanza ground is divided by the boundary between minor areas 25 & 26 and it has been split into east and west to reflect this.

- add locality 04 (S. Esperanza Canyon) to more completely cover the sablefish fishing grounds. Would formerly have been codes as Esperanza (03) or Nootka (02).

- add locality 05 (Inshore) to cover nearshore and inlets.

Minor area 26 - add locality codes 05 (Ououkinsh Canyon East), 06 (Crowther Canyon), 08 (N. Esperanza Canyon) to more completely cover the sablefish fishing grounds. Would formerly have been coded as Kyuquot Sound (04).

- add locality code 07 (Esperanza West). See notes above on Esperanza East.

- add locality code 10 (Inshore) to cover nearshore and inlets.

Minor area 27 - add locality codes 06 (Quatsino Canyon) and 07 (Ououkinsh Canyon West) to more completely cover the sablefish fishing grounds. Would formerly have been coded as West Cape Cook (02) or Quatsino Sound (03).

- add locality 08 (Inshore to cover nearshore and inlets.

Major Area 5A:

Minor area 9 - generally not used. The whole area is very shallow and is comprised of a circle 12 miles in diameter surrounding the Sea Otter group and Virgin Rocks.

Minor area 11 - add locality 12 (South Tide Marks) to cover the portion of Tide Marks that falls into major area 5A. Would formerly have been coded as West Triangle (07).

Major Area 5B:

Minor area 8 - add locality 13 (West Virgin Rocks). Would formerly have been coded as NE Goose.

- add localities 14 (Below Middle Bank) and 15 (Outside Middle Bank) to cover potential rockfish fishing grounds and some sablefish grounds. Below Middle Bank (14) would

formerly have been coded as SW Middle Bank (11) and Outside Middle Bank would have been coded as Outside Goose & Mitchell's (10) or Outside Cape St. James (12).

Major Area 5C:

Minor area 2BE - change locality 01 to West Horseshoe. Horseshoe ground is divided by boundary between minor areas 2BE and 5L and it has been split into east and west to reflect this. Horseshoe was formerly always coded in minor area 2BE.

Minor area 5L - add locality 10 (East Horseshoe). See notes on West Horseshoe.

Major Area 5D:

Minor area 5U - locality 05 (Stove Spot) no longer used. No one could recall the origin/location of this ground.

Major Area 5E:

Minor area 2AW - add locality 15 (Kano Inlet) to better cover sablefish grounds. Would formerly have been coded as Rennell Sound (01).

Minor area 2BW - add locality 05 (Flamingo Inlet) to better cover sablefish grounds. Would formerly have been coded as Anthony Island (01).

COMPUTER CODES FOR GROUNDFISH FISHING AREAS

Note: for all areas, locality code 00 is unknown and 09 is other.

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
4B	01	12	12	Unknown	00
				Retreat	01
				Drury Inlet	02
				McKenzie Sound	03
				Malcolm Is.	04
				Knight Inlet	05
				Gordon Channel	06
				Gilford Island	07
				Broughton Strait/ Telegraph Cove	08
				Other	09
				Queen Charlotte St.	10
				Goletas Channel	11
4B	01	13	13	Unknown	00
				Deepwater/Okisollo	01
				Topaz	02
				Phillips Arm	03
				Seymour Narrows/ Discovery Passage	04
				Cortes Island	05
				Bute Inlet/Stuart I.	06
				Cape Mudge	07
				Johnstone Strait	08
				Other	09
4B	01	14	14	Unknown	00
				West Cape Lazo	01
				Cape Lazo	02
				Union Bay	03
				Deep Bay	04
				Yellow Rk/Chrome I.	05
				Qualicum-Parksville	06
				Hornby Island	07
				Lambert Channel	08

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
4B	01	14	14	Other	09
				Grant Reef	10
				Stevens Passage	11
				NW Sangster/Seal Rf	12
4B	01	15	15	Unknown	00
				Okeover/Malaspina Inlet	01
				Toba Inlet	02
				Desolation Sound	03
				Lund-Powell River	04
4B	01	16	16	Unknown	00
				Westview	01
				Malaspina Strait	02
				Sabine Channel	03
				Thormanby Island	04
				Pender Harbour	05
				Jervis Inlet	06
				West Texada	07
				Sechelt Inlet	08
				Other	09
4B	01	17	17	Unknown	00
				Nanoose	01
				Boat Harbour	02
				Porlier Pass	03
				Stuart Channel	04
				E. Valdes & Galiano	05
				Walker Rock/ Trincomali Channel	06
				E. Gabriola/ Entrance Island	07
				DeCourcy Island	08
				Other	09
				Northumberland Ch.	10
				Winchelsea Islands	11
				Snake Island	12

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
4B	01	17	17	17 Central	13
4B	01	18	18	Unknown	00
				Swanson Channel	01
				Satellite Channel	02
				Active Pass	03
				Captain Pass	04
				Tumbo Channel	05
				Plumper Sound	06
				Ganges Harbour	07
				E. Mayne Island	08
				Other	09
				Sansum Narrows	10
				Saanich Inlet	11
4B	01	19	19	Unknown	00
				Victoria	01
				Sidney	02
4B	01	20	20	Unknown	00
				San Juan	01
				Sooke	02
				Sombrio	03
				Jordan River	04
4B	01	28	28	Unknown	00
				North Howe Sound	01
				South Howe Sound	02
				Indian Arm/ Burrard Inlet	03
4B	01	29	29	Unknown	00
				Sandheads	01
				McCall/Halibut Bank	02
				Cape Roger Curtis	03
				Sechelt	04

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
4B	01	29	29	Apex	05
				29 Middle West	06
				South Gabriola	07
3B	02	C	30	Unknown	00
				Quillayute	01
		all U.S. waters		Destruction	02
				Umatilla	03
3C	03	21	21	Unknown	00
				Swiftsure Bank	01
				Clo-oose	02
			U.S. waters	* Cape Flattery Spit	03
			U.S. waters	* Ollie	04
			!!Do not use!!	!! Nitinat Canyon	05
				Outside Swiftsure	06
				South Finger	07
3C	03	22	22	Unknown	00
3C	03	23	23	Unknown	00
				Firing Range	01
				Cabbage Patch	02
				SW Corner	03
				SE Corner	04
				Big Bank	05
				Fingers	06
				40 Mile Bank	07
				Cape Beale	08
				Other	09
				Deep Big Bank/ Barkley Canyon	10
				Barkley Sound	11
				Ucluelet/Loudon Canyons	12
				Nitinat Canyon	13
				12 Mile	14

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
3C	03	23	23	West Gully	15
				Barkley Hake	16
				Nitinat Hake	17
				NW LaPerouse	18
				Wickaninnish	19
3C	03	24	24	Unknown	00
				Lennard I./Tofino	01
				Sidney Inlet	02
				Inshore	03
				Clayoquot	04
				Cobb Seamount	05
				Father Charles Canyon	06
				Clayoquot Canyon	07
				South Estevan	08
				Other	09
3D	04	25	25	Unknown	00
				North Estevan	01
				Nootka	02
				Esperanza East	03
				S. Esperanza Canyon	04
				Inshore	05
				S. Perez	06
3D	04	26	26	Unknown	00
				East Cape Cook	01
				Lookout Island	02
				Ououkinsh	03
				Kyuquot Sd(>100 fm)	04
				Ououkinsh Cany East	05
				Crowther Canyon	06
				Esperanza West	07
				N. Esperanza Canyon	08
				Other	09
				Inshore	10

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
3D	04	27	27	Unknown	00
				Kains Island	01
				West Cape Cook	02
				Quatsino Sound	03
				Eickelberg/ Warwick Seamounts	04
				Union Seamount	05
				Quatsino Canyon	06
				Ououkinsh Cany West	07
				Inshore	08
				Other	09
5A	05	9	09	Unknown	00
				Virgin Rocks	01
				Smith Sound	02
5A	05	10	10	Unknown	00
5A	05	11	11	Unknown	00
				Triangle	01
				Cape Scott Spit	02
				Mexicana	03
				Topknot	04
				Pine Island	05
				South Scott Islands	06
				W. Triangle (25 mi)	07
				Dellwood Seamount	08
				Other	09
				South Triangle	10
				Pisces Canyon	11
				South Tide Marks	12
5B	06	8	08	Unknown	00
				NE Goose	01
				SE Goose	02
				NW Goose	03
				SW Goose	04

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
5B	06	8	08	Mitchell's Gully	05
				SE Cape St. James	06
				Hakai Pass	07
				Fitzhugh Sound	08
				Other	09
				Outside Goose & Mitchell's	10
				SW Middle Bank	11
				Outside Cape St. James	12
				West Virgin Rocks	13
				Below Middle Bank	14
				Outside Middle Bank	15
5C	07	2B East	02	Unknown	00
				West Horseshoe	01
				Ole Spot	02
				Reef Island	03
				South Moresby	04
				Ramsay Island	05
				Cumshewa/Reef Is. Flats	06
				Copper Island	07
				Dana Inlet	08
				Other	09
				NW Middle Bank	10
5C	07	5 Lower	06	Unknown	00
				North Moresby	01
				South Bonilla	02
				Principe Channel	03
				Caamano Sound	04
				West Banks Island	05
				Gil Island	06
				Ursula Channel	07
				Douglas Channel	08
				Other	09
				East Horseshoe	10

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
5C	07	6	07	Unknown	00
				Central Moresby	01
				Laredo Sound	02
				Milbanke Sound	03
				East Moresby	04
5D	08	2A East	01	Unknown	00
				Skidegate	01
				SW Seal Rocks	02
				Lawn Point	03
				Dogfish Bank	04
				West Two Peaks	05
5D	08	1 East	03	Unknown	00
				McIntyre Bay	01
				West Masset	02
				NE Langara	03
				SE Cape Chacon	04
				Dixon Entrance	05
				Parry Passage	06
5D	08	4	04	Unknown	00
				Butterworth	01
				Two Peaks	02
				Oval Hill	03
				Fingers	04
				Dundas	05
				Inside/Oval Bay	06
				Skeena	07
				Zayas Island	08
				Other	09
				Chatham Sound	10
				S. of Barren Island	11
				Portland Inlet	12
5D	08	5 Upper	05	Unknown	00
				White Rocks	01

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
5D	08	5 Upper	05	Bonilla	02
				Shell Ground	03
				Venus	04
		no longer used		* Stove Spot	05
				Ogden Channel	06
5E	09	2A West	31	Unknown	00
				Rennell Sound	01
				Frederick Island	02
				Buck Point	03
				Tian Head	04
				Cape Henry	05
				Fred Spot	06
				Marble Island	07
5E	09	2A West	31	Englefield Bay	08
				Other	09
				Bowie Seamount	10
				Beehive	11
				Hippa Island	12
				Tasu Sound	13
				South Hogback	14
				Kano Inlet	15
5E	09	2B West	34	Unknown	00
				Anthony Island	01
				Barry Inlet	02
				Gowgaia	03
				M.P. Spot	04
				Flamingo Inlet	05
5E	09	1 West	35	Unknown	00
				N Fred-Langara (shallow)	01
				N Fred-Langara (deep)	02

MAJOR AREA	CODE	MINOR AREA	CODE	LOCALITY	CODE
5E	09	1 West	35	Learmonth Bank	03
				NW Langara (133°)	04
				Langara Spit Inside/ Compass Rose	05
				Langara Spit Outside/Whaleback	06
				Rockpile-Langara	07
Alaska	10	South-eastern	32	Unknown	00
				Forrester	01
				Cape Ornaney	02
		all U.S. waters		Sitka Sound	03
				Salisbury Sound	04
				Cape Spencer	05
Alaska	10	Yakutat	33	Unknown	00
				Icy Point	01
		all U.S. waters		Cape Fairweather	02

APPENDIX E - CHARTS OF FISHING GROUNDS AND GROUNDFISH AREAS

Figure 1 - Fishing grounds located in Dixon Entrance, west coast of the Queen Charlotte Islands and northern Hecate Strait.

Figure 2. Fishing grounds located in southern Hecate Strait and Queen Charlotte Sound.

Figure 3. Fishing grounds located in southern Queen Charlotte Sound and off the northwest coast of Vancouver Island.

Figure 4. Fishing grounds located in the northern portion of the Strait of Georgia and off the central, west coast of Vancouver Island.

Figure 5. Fishing grounds located in the southern portion of the Strait of Georgia and off the southern end of Vancouver Island.

Figure 6. Major and minor statistical areas for the British Columbia trawl fishery.

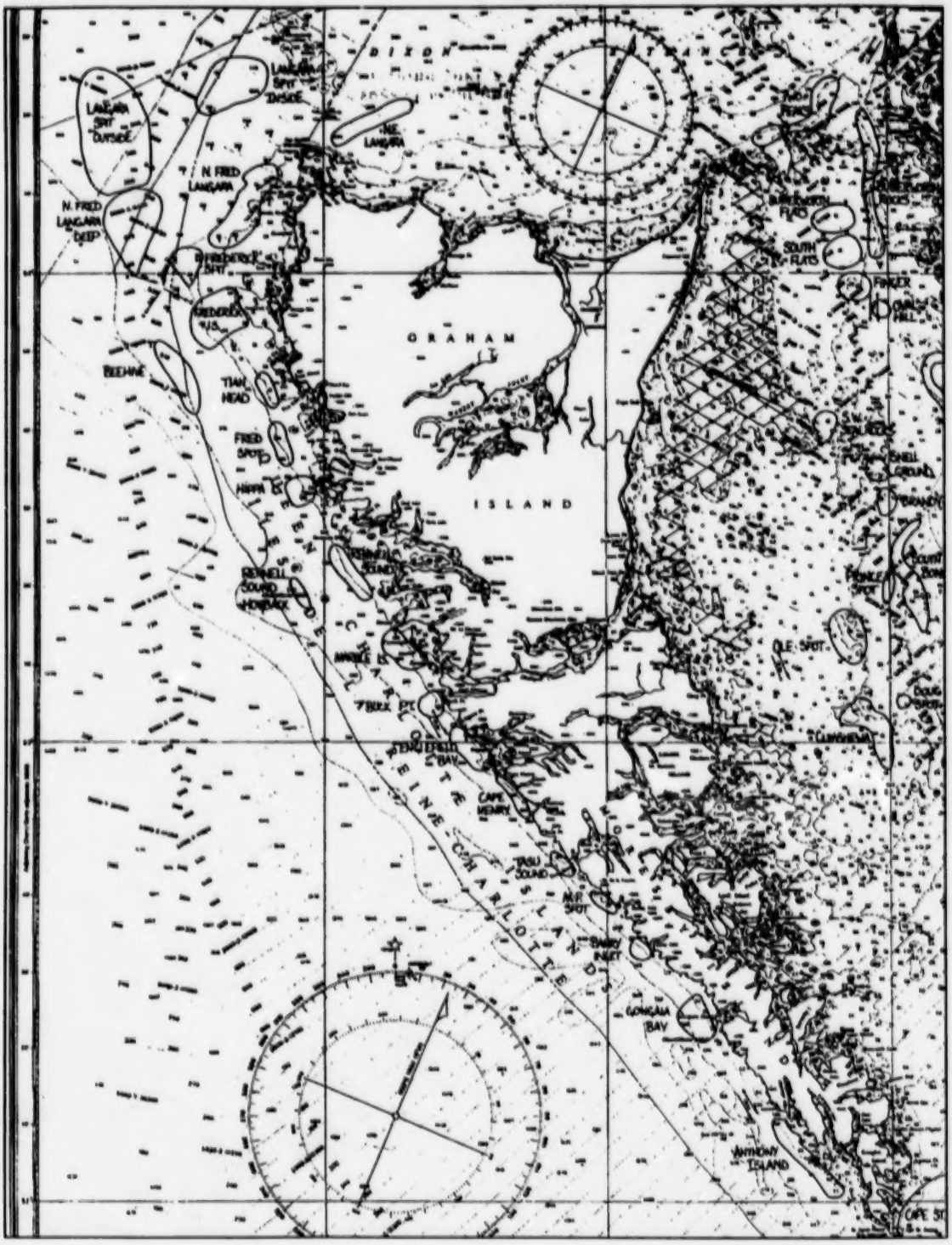
Figure 7. Groundfish areas located in Dixon Entrance, west coast of the Queen Charlotte Islands and northern Hecate Strait.

Figure 8. Groundfish areas located in southern Hecate Strait and Queen Charlotte Sound.

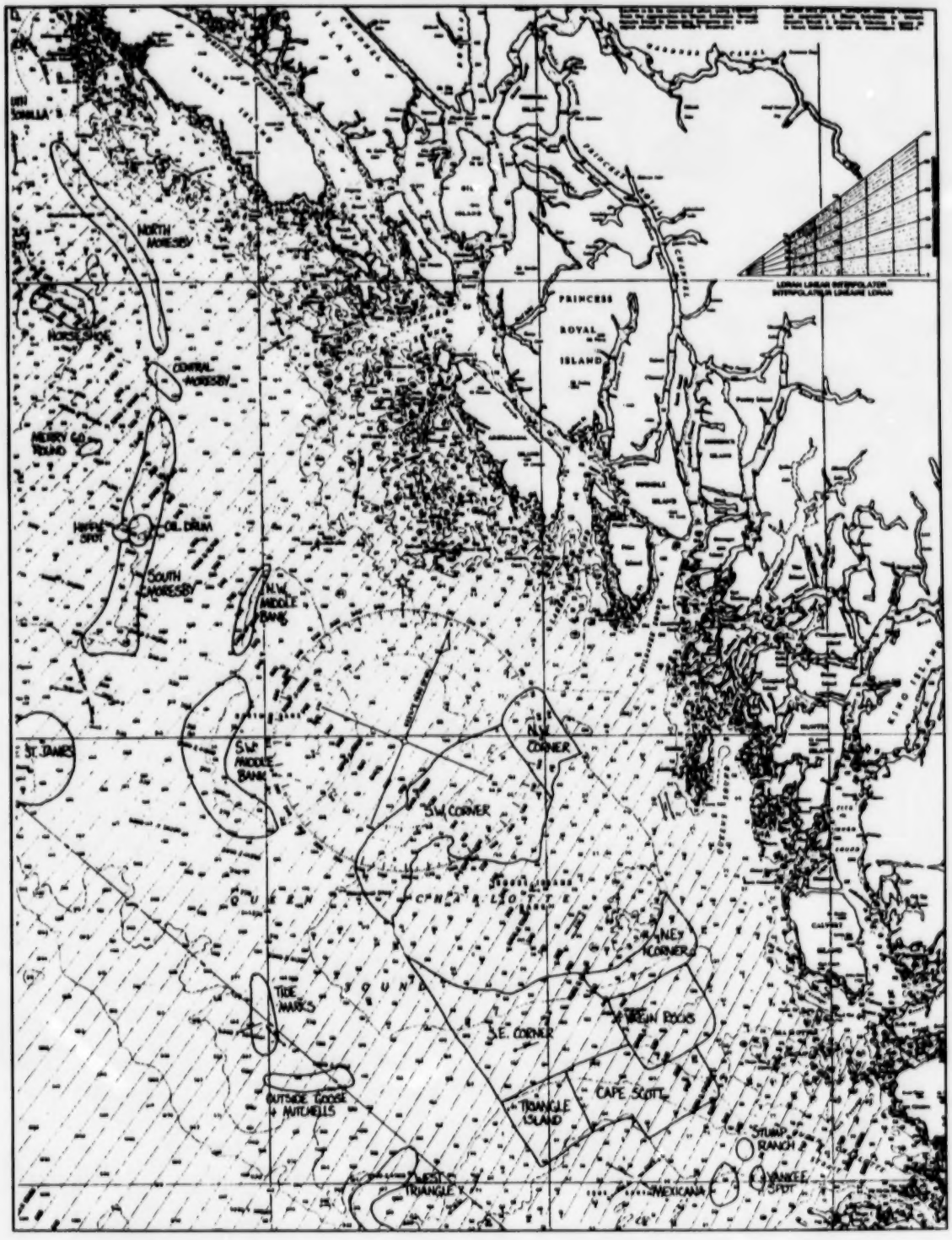
Figure 9. Groundfish areas located in southern Queen Charlotte Sound and off the northwest coast of Vancouver Island.

Figure 10. Groundfish areas located in the northern portion of the Strait of Georgia and off the central, west coast of Vancouver Island.

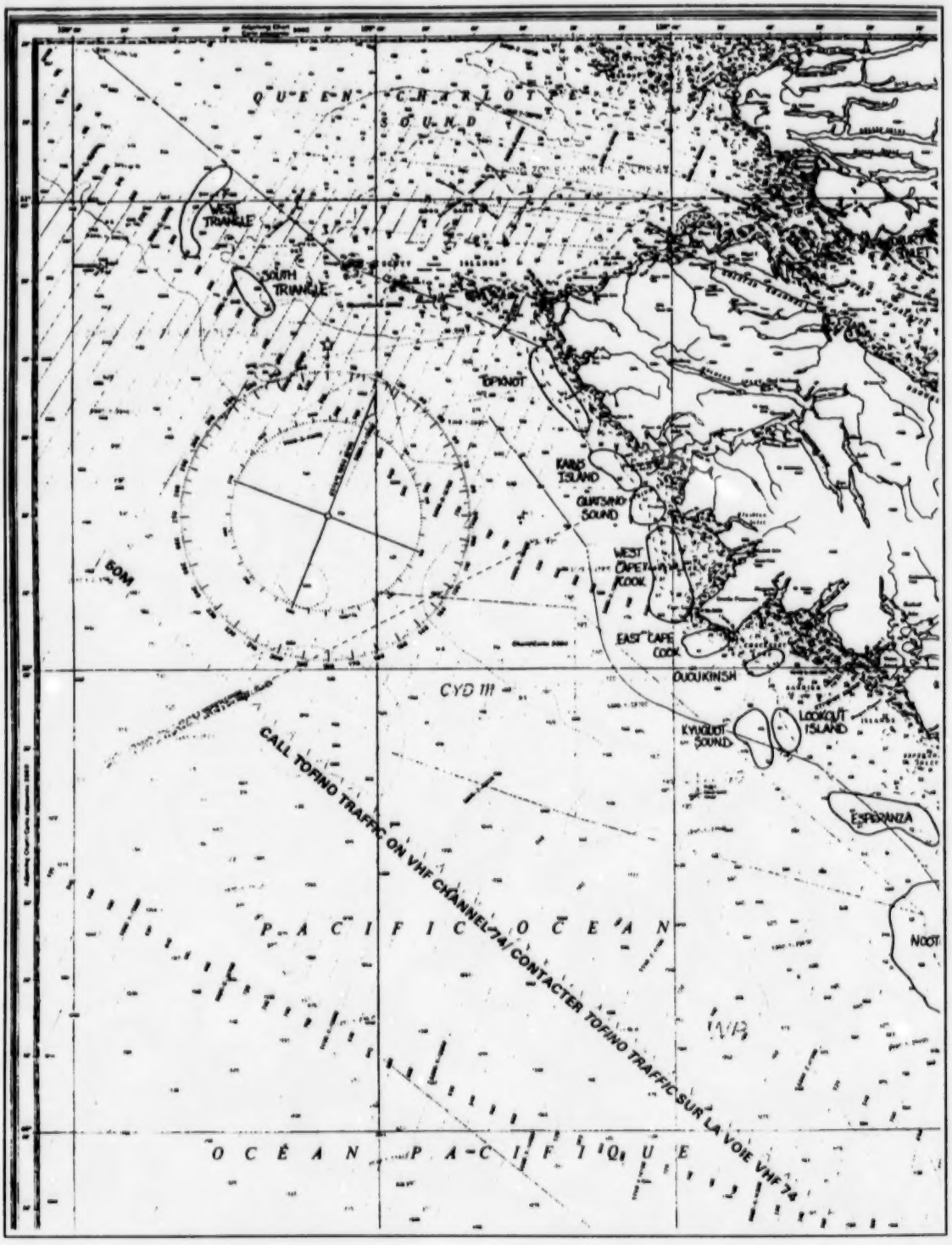
Figure 11. Groundfish areas located in the southern portion of the Strait of Georgia and off the southern end of Vancouver Island.



Appendix E - Fig.1. Fishing grounds in Dixon Entrance, west coast of the Queen Charlotte Islands and northern Hecate Strait.

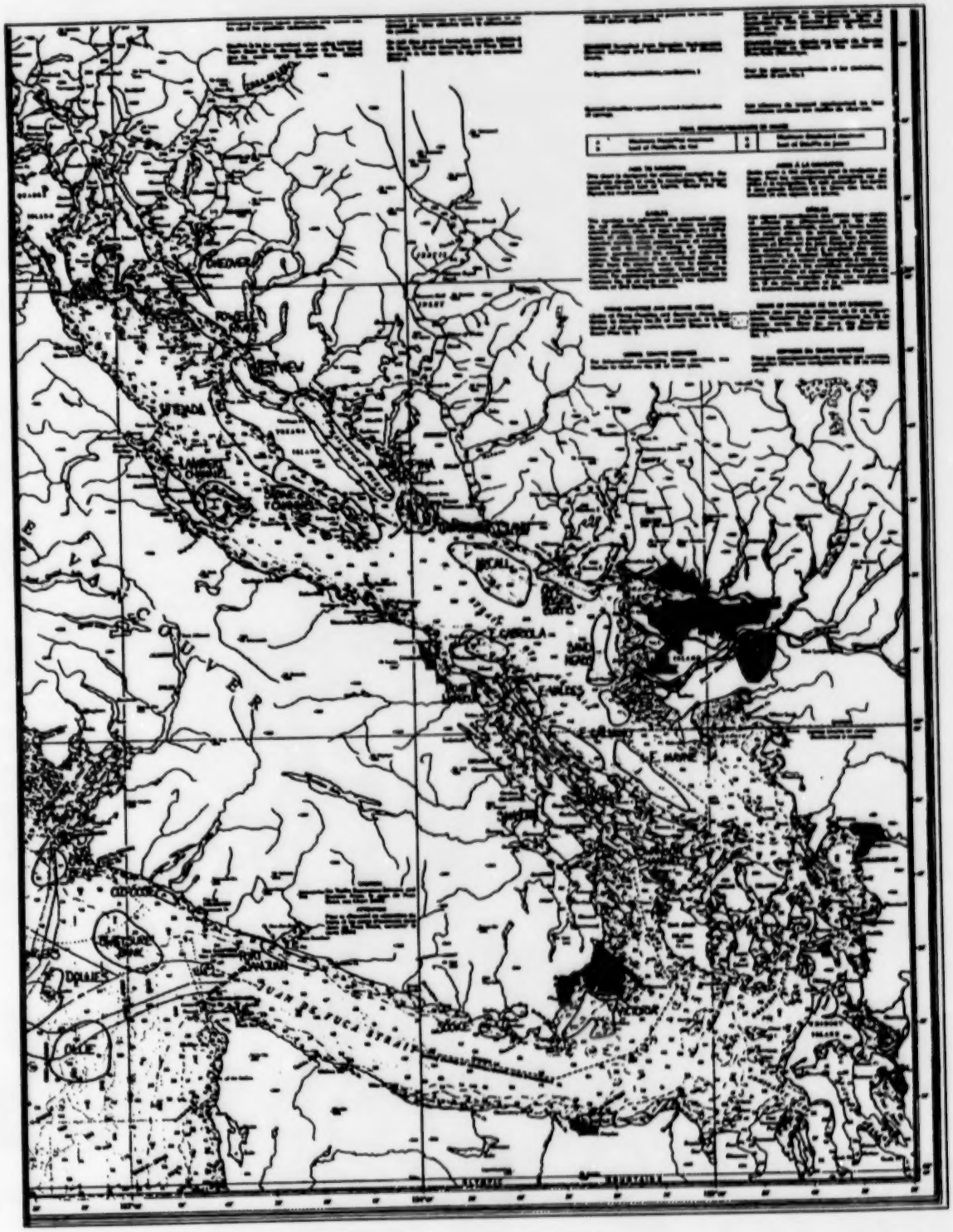


Appendix E - Fig.2. Fishing grounds located in southern Hecate Strait and Queen Charlotte Sound.

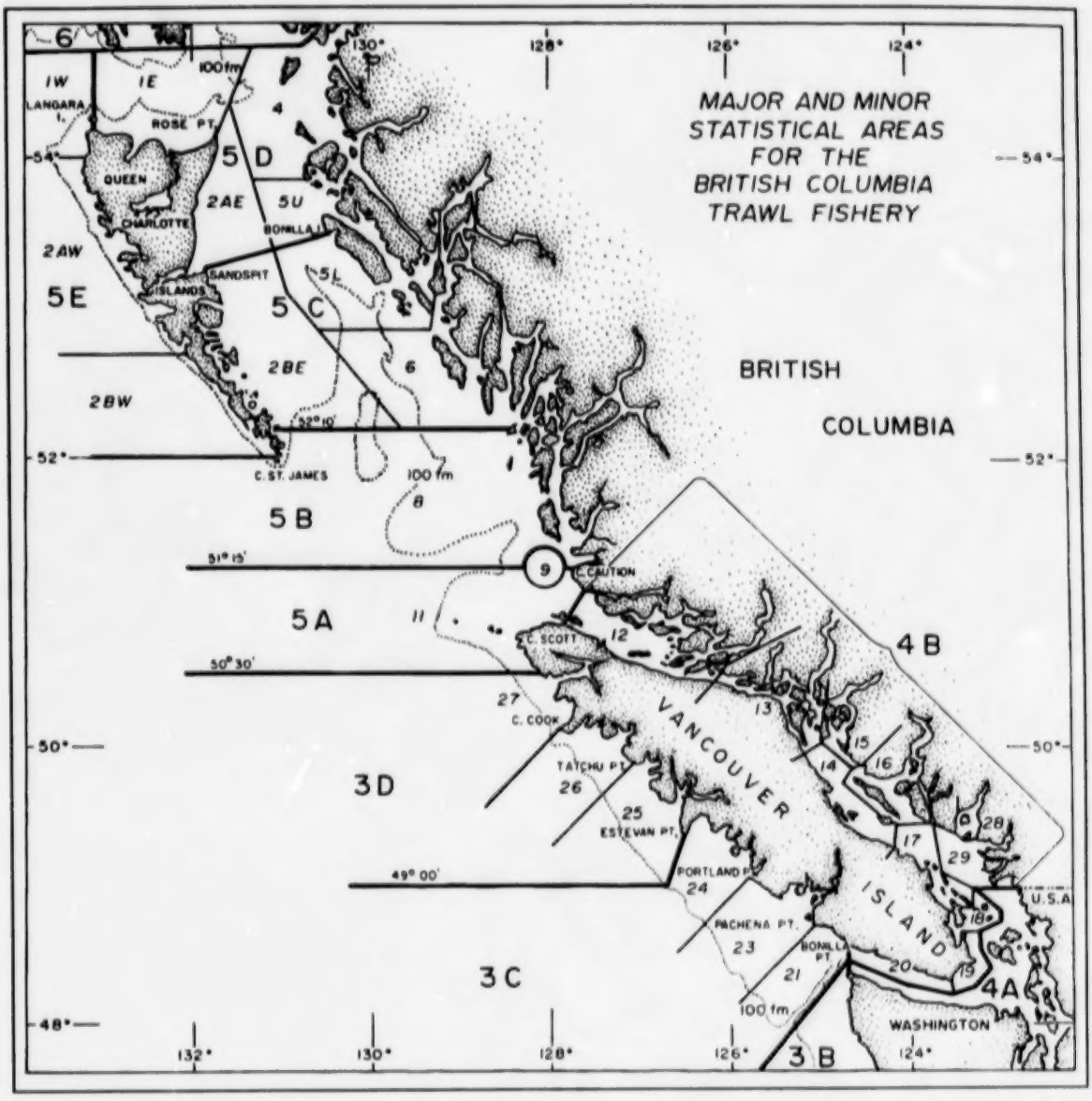


Appendix E - Fig.3. Fishing grounds located off the southern portion Queen Charlotte Sound and the northwest coast of Vancouver Island.

Appendix E - Fig. 4. Fishing grounds in the northern portion of the Strait of Georgia and off the west coast of Vancouver Island.

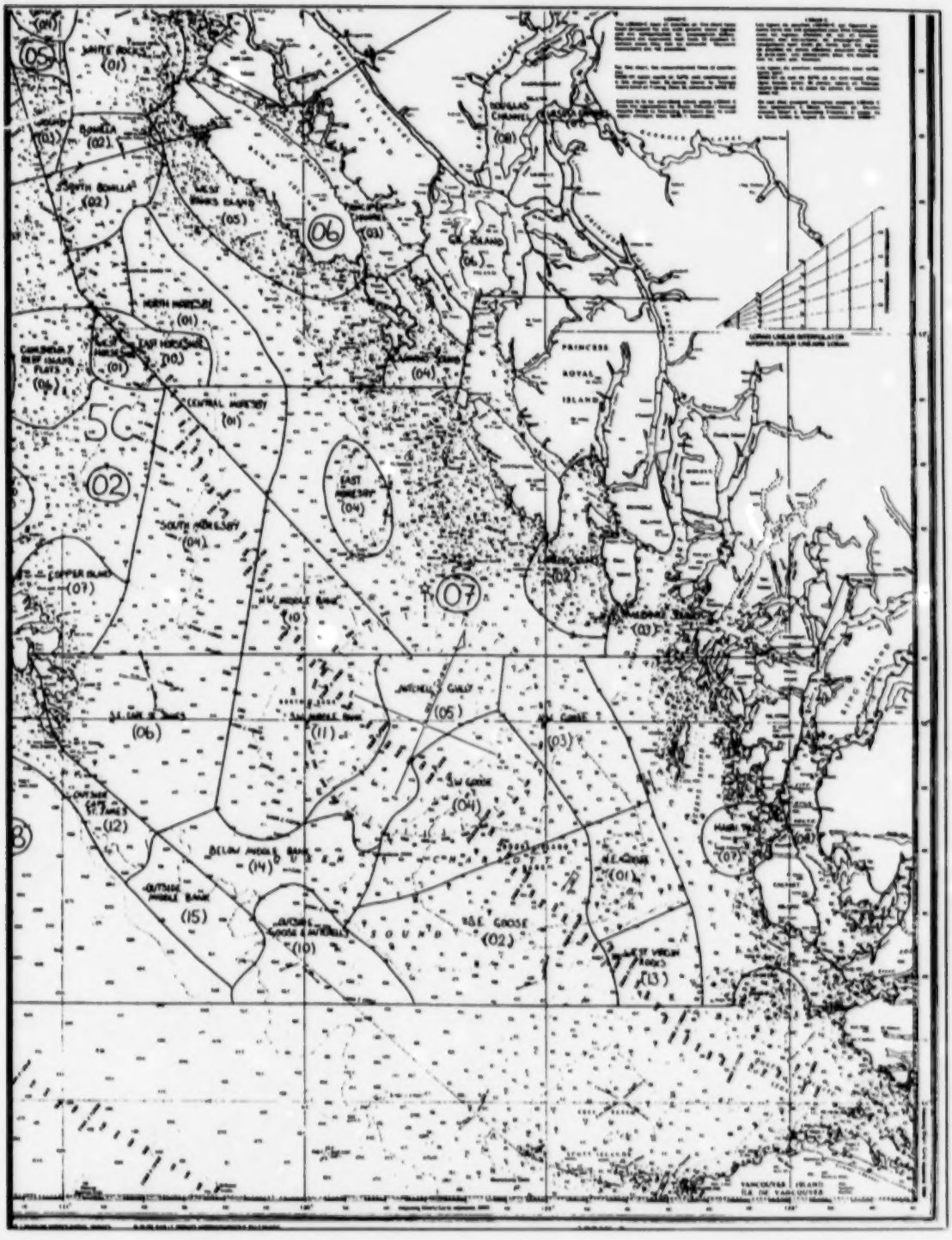


Appendix E - Fig. 5. Fishing grounds in the southern portion of the Strait of Georgia and and the southern end of Vancouver Island.

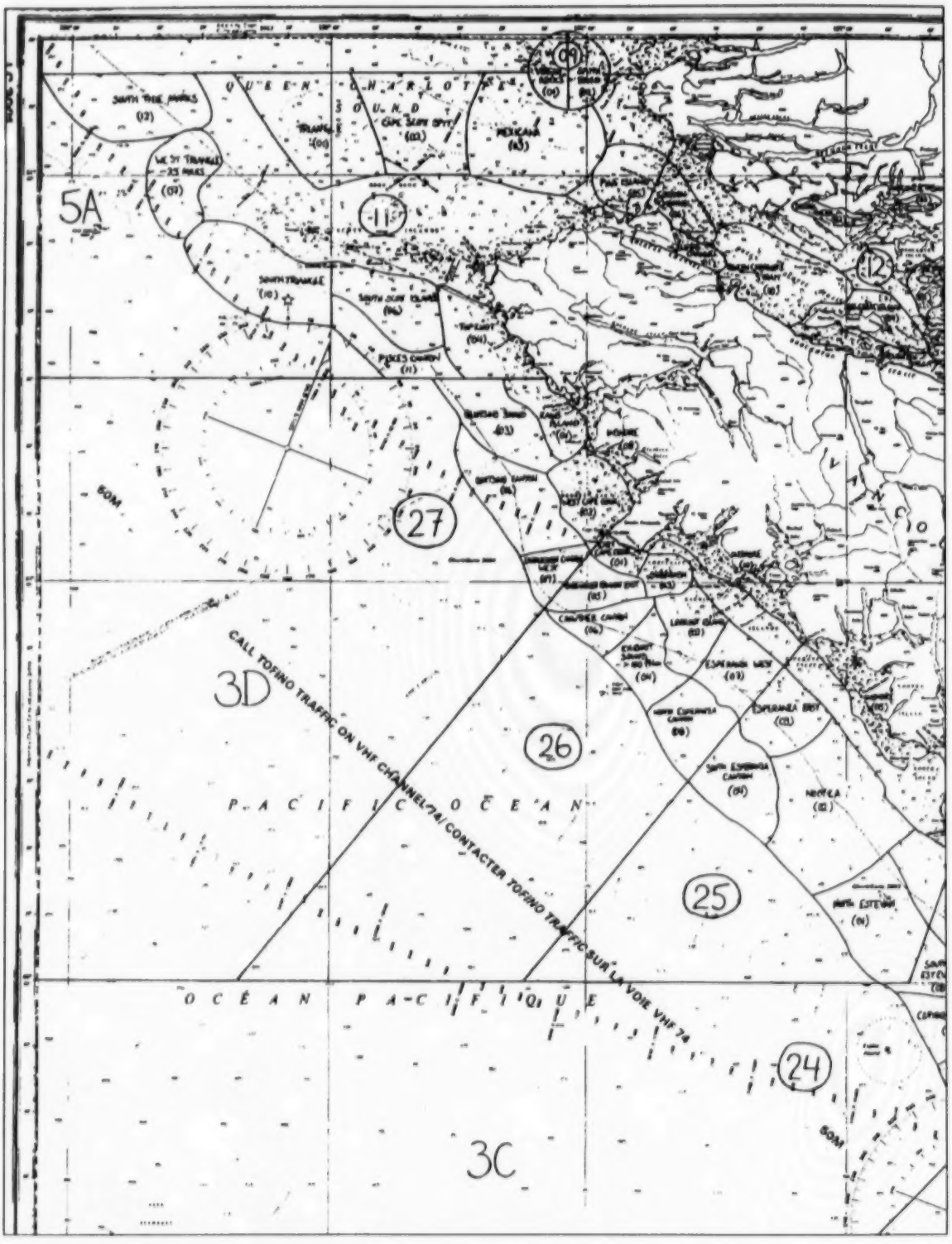


Appendix E - Fig.6. Major and minor statistical areas for the British Columbia trawl fishery.

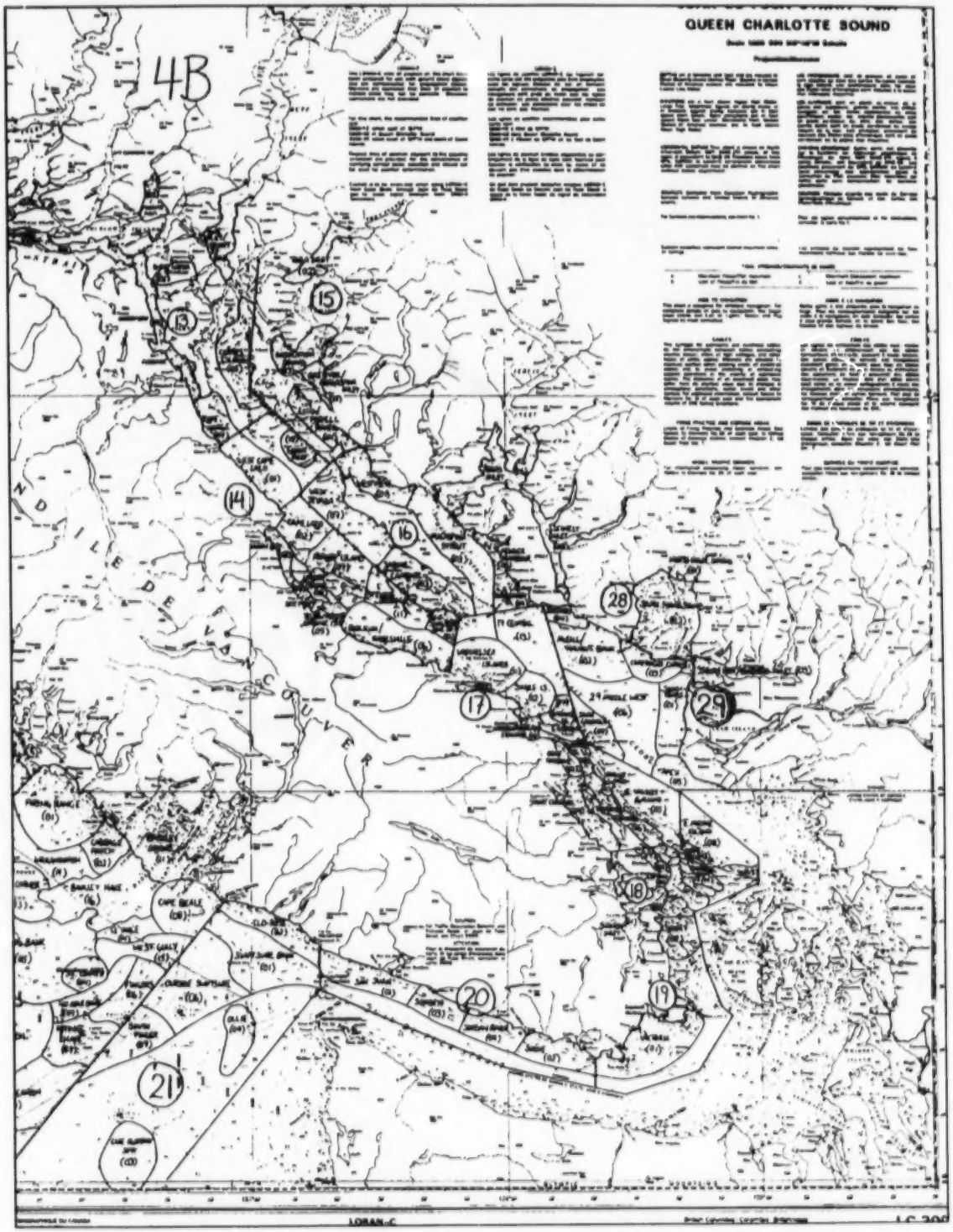
Appendix E - Fig.7. Groundfish areas located in Dixon Entrance, west coast of the Queen Charlotte Islands and northern Hecate Strait.



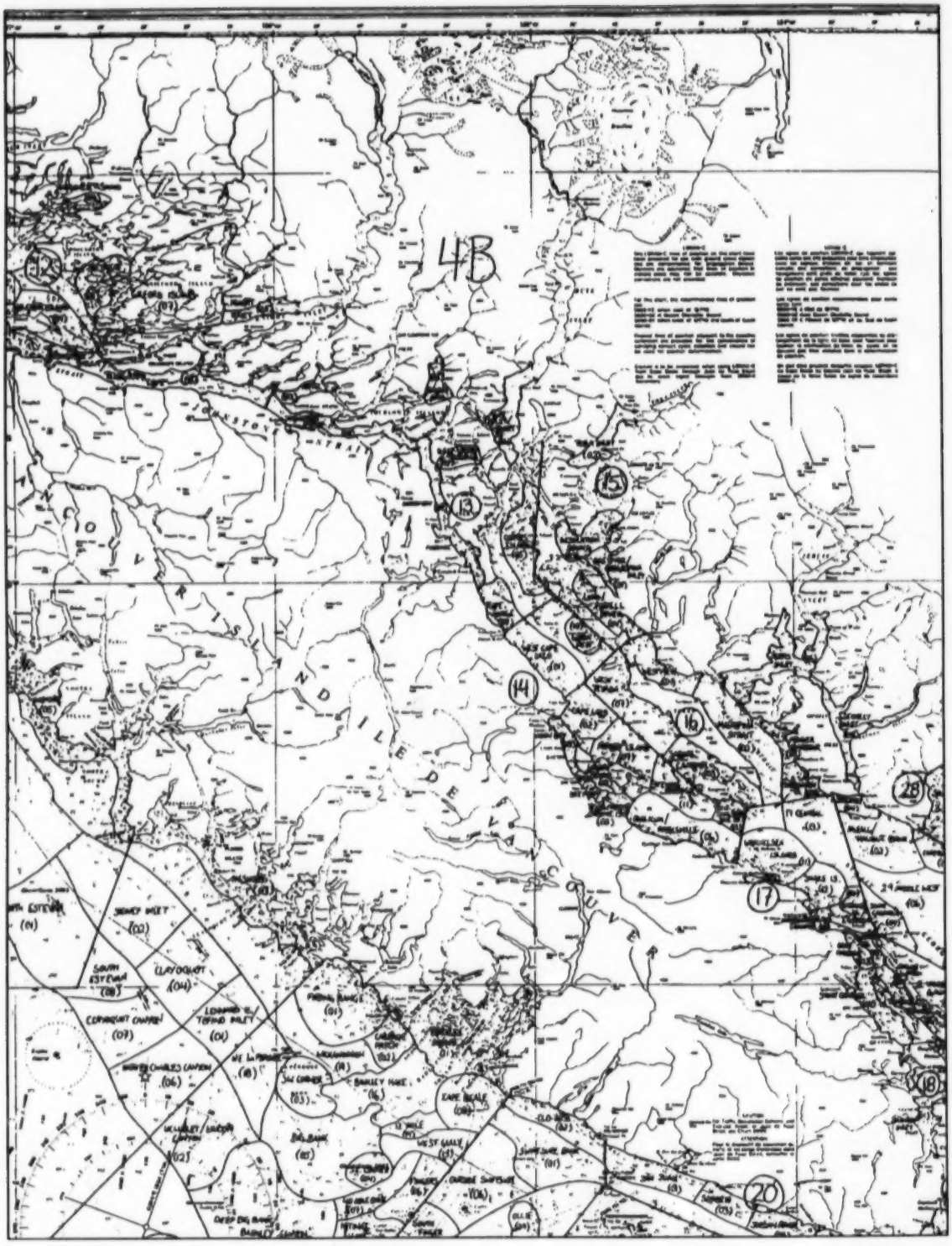
Appendix E - Fig.8. Groundfish areas located in southern Hecate Strait and Queen Charlotte Sound.



Appendix E - Fig.9. Groundfish areas located in southern Queen Charlotte Sound and off the northwest coast of Vancouver Island.



Appendix E - Fig.10. Groundfish areas located in the northern portion of the Strait of Georgia and off the central, west coast of Vancouver Island.



Appendix E - Fig.11. Groundfish areas located in the southern portion of the Strait of Georgia and off the southern end of Vancouver Island

APPENDIX F - GFREAD.DOC

```
C HOW TO USE SUBROUTINE GFREAD
C ----------------------------
C
C  This routine does a sequential read of GROUND FISH MASTER FILES.
C  THE CALLING PROGRAM MUST NOT USE LOGICAL UNITS 50 or 51.
C                    ---
C  THESE UNITS ARE USED BY GFREAD AND GFREADR
C
C  Form of the call:
C
C  CALL GFREAD(I,NYR,PASSWORD)
C
C  I IS AN I*4 VARIABLE. IT MUST BE INITIALIZED TO ZERO FOR THE
C  FIRST CALL TO GFREAD.IT MUST NOT BE ALTERED SUBSEQUENTLY BY
C  THE CALLING PROGRAM.GFREAD WILL RETURN I=-1 TO SIGNAL END OF
C  FILE OR IF THE YEAR CALLED FOR IS NOT ON THE SYSTEM.
C
C  NYR is the year which the calling program wants to read.
C     (e.g. 79, for landings for year 1979)
C
C   PASSWORD IS A CHARACTER*14 VARIABLE.
C   If password is incorrect, VESSEL-ID IS NOT returned.
C
C  THE MASTER FILE IS SEQUENCED BY MINOR AREA WITHIN SOURCE.
C  Ie, if you are only interested in source 1 and 2 you can
C  assume eof when source changes to 3.
C  NOTE THAT THERE ARE NO SOURCES 3 THRU 6 PRIOR TO 1979.
C
C  The calling program must be linked like so:
C  $LINK YOURPROG,-
C   NAN1:[DEMERSAL.PROGRAMS]DEMLIB'CHIP'/LIB,-
C    NAN1:[DEMERSAL.SKIPPER]SKIPLIB'CHIP'/LIB
C
C
C  ONE COMPLETE LANDING is delivered to your program by EACH CALL.
C  It will be in the common blocks described below.
C  A landing may have up to 50 SPECIES-USAGE entries.
C  The NUMBER OF ENTRIES present will be in the variable LSPEC.
C
C  A -1 IN ANY FIELD INDICATES THAT THE DATA WAS NOT PRESENT ON
C  THE LANDING SLIP DATA.
C  THE SPECIES VECTOR IS IN ASCENDING ORDER BY SPECIES.
```

Appendix E cont'd

```
C  NOTE:
C  LANDINGS THAT HAVE NO CATCH (IE REFLECT EFFORT ONLY),WILL
C  HAVE LSPEC=1,SP CODE=0,UTIL=-1
C
C  The common block code can be accessed by using the FORTRAN INCLUDE
statement.
C  INCLUDE 'NAN1:[DEMERSAL.PROGRAMS]GFMSTCOM.FOR'
C  The variable name in most cases is self explanatory.
C  SOME ARE NOT.
C  SOR - SOURCE  (1 THRU 6)
C  ISER - SERIAL NUMBER OF LANDING.(IS NOT UNIQUE WITHIN YEAR)
C  IDAYF - DAYS FISHED IN TENTHS.EG 35 MEANS 3.5 DAYS
C  ITOW  - TOW TIME OR SOAK TIME DEPENDING ON SOURCE (MINUTES) **
C        ** ON ROLLUP FILES FOR SOURCES 5 AND 6  ITOW IS IN HOURS
C  RHRS  - TOW OR SOAK TIME - IN HOURS, REAL*4 VARIABLE
C  ISKATE - NUMBER OF TRAPS/SKATES
C  ISPAC - HOOK/TRAP SPACING
C  IHOOK - NUMBER OF HOOKS/TRAPS
C  IDRAG - NUMBER OF DRAGS
C  IDMIN ETC - DEPTHS
C  CLS - VESSEL CLASS
C  GR - GEAR TYPE WITHIN TRAWL (SOURCE 1 AND 2)
C  TRAPT - TRAP TYPE
C  IALLCAT - TOTAL CATCH
C  ISCOD,ISCAT,UTIL - SPECIES CODE CATCH AND USAGE
C                  ("LSPEC" ENTRIES,MAX 50)
C  VES - VESSEL-ID
C  LDUM - RESERVED FOR GFREAD
C
C  NOTE THAT SOME FIELDS ARE SOURCE DEPENDANT.
C
```

Appendix G - GFMSTCOM.FOR Common blocks for GFSEL and GFREAD

```
C   MASTER FILE BLOCK
C   ------------------------
C
    BYTE
   .    SOR,DAY,MON,YR,PORT,LTRIP,CLS,GR,AID,MAJ,MIN,LOC,
   .    TRAPT,BAIT,UTIL(50),LDUM,LSPEC
C
    CHARACTER
   . VES*3
C
    INTEGER*2
   . ISER,IDAYF,IDRAG,ITOW,ISKATE,ISPAC,IDMIN,IDMAX,IDAVG
   . ,ISCOD(50)
C
    INTEGER*4
   . IALLCAT,ISCAT(50),IHOOK,SKIPPER
C
    REAL*4 RHRS
C
    COMMON /MSTRBYTE/
   .    SOR,DAY,MON,YR,PORT,LTRIP,CLS,GR,AID,MAJ,MIN,LOC,
   .    TRAPT,BAIT,UTIL,LDUM,LSPEC
C
    COMMON /CHARBLK2/
   . VES
C
    COMMON /I2BLK/
   . ISER,IDAYF,IDRAG,ITOW,ISKATE,ISPAC,IDMIN,IDMAX,IDAVG


   . ,ISCOD
C
    COMMON /I4BLK/
   . IALLCAT,ISCAT,IHOOK,SKIPPER
C
    COMMON /R4BLK/
   . RHRS
C
C    VARS FOR "SUP" FILE  (FEB94)
    CHARACTER
   .SLAT1*2,SLAT2*5,SLONG1*3,SLONG2*5,
   .ELAT1*2,ELAT2*5,ELONG1*3,ELONG2*5,POR1*1,
   .MLAT1*2,MLAT2*5,MLONG1*3,MLONG2*5
    COMMON /NEWCHARSBLK/
```

Appendix G cont'd

```
     .SLAT1,SLAT2,SLONG1,SLONG2,
     .ELAT1,ELAT2,ELONG1,ELONG2,POR1,
     .MLAT1,MLAT2,MLONG1,MLONG2
      INTEGER*4 SUPPNT,SUPREC,SUPSER,TOWNUM
      COMMON /NEWNUMSBLK/
     .SUPPNT,SUPREC,SUPSER,TOWNUM
C
C    POR1 - PORT OF UNLOADING   PORT - PROCESSING PORT
C
C    VARS FOR "MORE" FIELDS - LOG TYPE AND SALES TYPE JUL94
      CHARACTER STYP*1  ! M U X
INTEGER*4 LTYP    !1,2,3  LOGBBOG SOURCE
      COMMON /MOREI4BLK/ LTYP
      COMMON /MORECBLK/  STYP
C
C   ---> PROGRAMS USING RTN GFREAD MUST RESERVE UNITS 50 AND 51
C   ---> FOR USE BY GFREAD
C-----------------END GFMASTER FIELDS-----------------
```